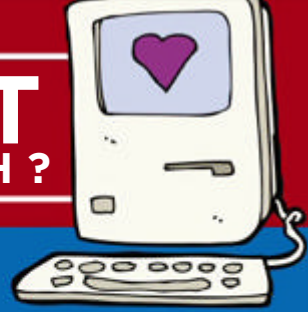


REFURBISHED PCs ON TEST
JUST HOW FAR CAN £400 STRETCH?



micro mart

Computing in the know

Plus

- How To Replace A Laptop DVD Drive With An SSD
- Unlock The Hidden Power Of Microsoft Office
- Mouse Alternatives: From Trackballs To Wireless Pens

DROONES

**WHAT CAN
THEY DO?**

**WHAT CAN
YOU GET?**

**AND ARE
THEY SAFE?**



26 MAR - 1 APR 2015 ISSUE 1355

£2.50



tinyurl.com/mm1355mm



Find your perfect PC at CCL

Workstations Media Centre
“ Gaming Home & Family ”
 Education Custom Builds
 Business & Office Find your perfect PC at CCL

Why choose CCL for your new PC?

FREE Next Day Delivery

FREE Help and Support

3 Year Warranty as Standard

Find your Perfect PC at CCLOnline.com

With 20 years PC building experience, you can trust CCL to build your perfect PC

Home & Family PCs



Home & Family PCs from
£169.99
 Inc VAT & Delivered

COVERED BY
3YR
 WARRANTY

Gaming PCs



Gaming PCs from
£259.99
 Inc VAT & Delivered

FREE
NEXT DAY
 DELIVERY

Business & Office PCs



Business & Office PCs from
£219.99
 Inc VAT & Delivered

WITH
3YR
 ONSITE WARRANTY

Workstation PCs



Workstation PCs from
£429.99
 Inc VAT & Delivered

WITH
3YR
 ONSITE WARRANTY

CCL offer a great range of PCs tailored to your individual needs from a family PC right up to a bleeding edge gaming monster! If you already know exactly what you want then speak with us about a custom PC made just for you!

Why not simply pick your components and we'll build it for you!
You Design It, We Build It



call: **08000 50 10 10**

visit: www.cclonline.com/pc email: pcsales@cclonline.com

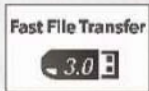
find us: CCL Computers Ltd, Inmoor Road
 Off Cross Lane, Bradford, BD11 2PS

Prices correct at time of going to publishing (4th Feb 2015). Images & case designs are for illustrative purposes only call for details. Monitors and desktop bundles are available separately.

ASUS X·SERIES

Transform your expressiveness Definitive everyday computing in black and white

An all-around 15.6-inch notebook with user-centric features for everyday computing



ASUS X551MAV 15.6" 4GB 1TB Celeron Dual Core Laptop

"Classic Timeless Design, Smooth Computing Experience & Precise, crystal clear audio to complete the cinematic experience"

Designed for everyday multitasking and entertainment for smart and practical users, the ASUS X Series notebooks redefine your expectations of all-rounder notebook. Its slim profile is 5% thinner than the previous X Series notebook, and still houses to a large touchpad with intuitive multi-point Smart Gesture input, USB 3.0 provides fast data transfer Value-packed with all the essentials, the X Series reinvents your daily computing experience.

CPU	Intel Celeron N2840 2.1GHz CPU	Graphics	Intel HD 4000 Graphics
RAM	4GB Memory	Network	WiFi & LAN
Hard Drive	1TB Hard Drive	OS	Windows 8 with Bing

£229.99
inc VAT

FREE Delivery

CCL Code - NOT01182

call: **08000 50 10 10**

visit: www.cclonline.com

find us: CCL Computers Ltd, Inmoor Road
Off Cross Lane, Bradford, BD11 2PS

Prices correct at time of going to publishing (4th March 2015).
Images are for illustrative purposes only.
Monitors and peripherals are available separately.
Games / Software shown as compatible are not included.



www.cclonline.com

Contents

This week...



08

Should You Buy A Drone?

08 Should You Buy A Drone?

No, we don't mean the sound of the editor's voice when he's talking about his egg shell collection. What we mean is one of those wonderful remote-controlled flying machines that have become so popular in recent times. Prices are falling all the time, and all kinds of things can be achieved with them. They're also not short of a few problems, though, as David Crookes tells us

20 Mouse Alternatives

Since it first came into being, the mouse has become an integral part of using a desktop PC. However, not everyone gets along with them, and for those people an alternative form of control is needed. What sort of things are available, though, and how much will they cost you? We take a look at a selection of the options

28 BBC Micro Bits

The BBC Micro is a system that holds a special place in the hearts of many computer enthusiasts, and now it's due to have a spiritual successor. Yes, the British Broadcasting Corporation is set to launch a new computer for schools, but this time it's going down the hobbyist micro board route with something similar to the Raspberry Pi. David Hayward examines what it has to offer and just how useful it's likely to be

46 Group Test

A new PC is something that many of us want, but it's also a cost that we often cannot justify. If that's the case for you, then maybe a refurbished system is more within your reach. They might not be new, but you know what you're getting has been looked over and refreshed by experts –and you'll save a ton. We've been checking out six examples to see just what we can get for our money



20

Mouse Alternatives



28

BBC Micro Bits

56 Laptop SSD Upgrades

66 Game Streaming

56 Laptop SSD Upgrade

Changing the components in a laptop is often all but impossible. However, alongside changing the RAM, there's one upgrade that's normally within most people's grasp: a new hard drive. Rather than just adding more capacity, though, you could also add a boatload of speed by putting in an SSD. Mark Pickavance looks at how to do it, and also explains how you can keep your old disk in your laptop as well by swapping out your DVD drive

60 Office Scripting

Microsoft's Office suite, in spite of competition from numerous free alternatives, has survived up to this point. One reason for that is the fact it's an extremely powerful program, and the ability to achieve things with scripts is proof of that. To give you a taste of what's possible with a little know-how is Aaron Birch

66 Game Streaming

When OnLive launched a few years ago, it was hoping that people would be ready for a system that involved streaming games over the internet, rather than running them locally. Unfortunately, it didn't quite work out, but the idea of streaming over a home network is one that's picking up speed. Ian McGurran takes a look at the different ways of achieving this

Also In This Issue...

30 Component Watch

James Hunt looks at some high-quality Bluetooth speakers

70 App Group Test

Keri Thomas rounds off the series with a look at food apps for Android

74 Remembering

David gets misty eyed over some retro joysticks

75 Frustrations

This week's source of ire is none other than Excel

94 Crowdfunding

Another duo of projects that have caught our eye this week

95 App Of The Week

David Hayward gets to blow things up again, this time with *Skyforce 2014*

Group Test Refurb Systems Under £400

- 46 MicroDream M91p
- 47 Tier 1 Lenovo T430
- 48 Pure IT Refurbished Dell Optiplex 790 SFF
- 49 Morgan Computers Fujitsu EsPrimo P910
- 50 Gigarefurb HP 8200 Elite
- 51 Sum up

Reviews

- 38 MSI Adora20 AIO PC
- 39 Brother MFC1910W
- 40 Western Digital My Cloud EX2100
- 42 ISavage Lands
- 43 System Mechanic 14.5
- 44 DivMMC EnJOY! Black Edition

Experts

- 90 Ask Aaron
- 92 Ask Jason

Specialists

- 76 Linux Mart
- 77 Amiga Mart
- 78 Mobile Mart
- 79 Hardware Mart
- 80 Gaming Mart

News

- 32 The Latest News
- 53 Your Letters

Regulars

- 54 Subscriptions
- 82 Ad Index
- 84 IT Essentials
- 86 Classifieds
- 96 Logging Off



SAVE A BUNDLE

Subscribe to Micro Mart today and save 24% on the shop price.

Call 0844 844 0082

Basic annual rate

UK: £77.50

Europe: £185

Rest of World: £340

Online subscriber service

Change your address and renew your subscription at

www.subsinfo.co.uk

Email:

micromart@servicehelpline.co.uk

SUPERB MORGAN BARGAINS • WITH EXTRA 10% DISCOUNT! MASSIVE COMPUTING SALE! WITH AN EXTRA 10% DISCOUNT

Get an extra 10% OFF your new sale item or almost anything on our site!

Just visit our website today www.morgancomputers.co.uk

Enter the promotional code **MMTEN** at the checkout online and see your prices reduce by an extra 10%! OR call **FREEPHONE 0800 008 7451** and we'll do the work for you!

WESTERN DIGITAL 1TB HARD DRIVE



- Size/Bay Height: 3.5" x 1/3H
- Capacity: 1 Terabyte • Cache (MB): 32
- Interface: Serial ATA-600
- Transfer Rate: 600 MBps
- Internal transfer Rate: 110 MBps
- Buffer Size: 64 MBps
- Spindle Speed (RPM): 7,200
- Shock Tolerance Operating: 65 g @ 2ms
- Size (WxDxH): 10.2 x 14.7 x 2.6 cm
- Weight: 0.6 kg

State of the art, top specification, top brand internal hard drive

MODEL WD10EURX 1TB

WD Western Digital

Part Code: 41663
NOW ONLY
£26.96



HP 8000 ELITE SPECIAL!

Now with an incredible 8GB DDR3 RAM, a Massive 1TB HDD, WiFi and a 1GB Graphics card the reliable and powerful 3.0GHz Core2Duo Intel processor will make short work of most tasks!

- Intel Core 2 Duo E8400/3 GHz (Dual-Core)
- 3.0 Ghz • 8GB RAM (installed)/16 GB (max)
- 1TB - SATA • DVD/CD • Stereo Sound
- Network: Wi-Fi & Gigabit LAN • Asus G210 Graphics
- Ultra Small: 33.8 cm x 37.9 cm x 10 cm
- Windows 7 Professional Operating System

TOP SPEC! LOW PRICE!

NOW ONLY
£224.96

AMAZON KINDLE FIRE HDX 7" - SPECIAL BARGAIN BUY!



QUAD CORE!
 POWER!



amazon kindle BARGAIN

Instantly watch anytime on your Kindle Fire. Buy or rent from a huge selection of more TV episodes and Films than all TV channels put together. Subscribe to Prime and enjoy unlimited streaming of thousands of popular films and TV shows from Britain's largest subscription streaming service.

- Quad Core Processor
- Stunning HD display
- 1920x1200 HD Res
- 4Gb RAM/16Gb Storage
- Wi-Fi, Bluetooth, 3G/4G
- Fast web browsing
- Mojito OS
- Front-facing camera

CURRENT ARGOS PRICE

~~£254.99~~

CURRENT JOHN LEWIS PRICE

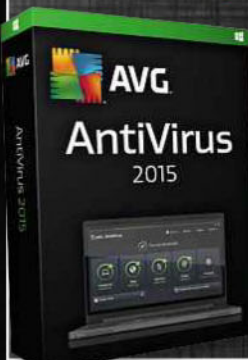
~~£264.99~~

Part Code: 41813

NOW ONLY
£152.96

AVG ANTIVIRUS 2015

1 Year 1 User Download Code
 Delivery Within 1 Working Day via eMail



The backbone of your PC's security system - offers protection from a range of IT threats and provides the basic tools needed to protect your PC!

Protect your computer from harmful malware and viruses with this superb AVG Anti Virus pack. This pack provides protection against spyware, trojans and phishing, as well as providing a wide range of privacy options.

AVG ONLINE PRICE

~~£23.95~~

NEW LOW PRICE!

Part Code: 411185

NOW ONLY
£7.16

HP PAVILION 15.6" QUAD CORE LAPOP

Top spec full size quad core Windows 8 HP laptop with 8Gb RAM and a fast 1TB hard drive!



QUAD CORE!

- 1.6GHz AMD A8-4555M Quad Core processor • 8Gb RAM
- 15.6" 1366 x 768 (pixels) Hi-Res Ultra Bright Screen
- 1Tb HD • Wi-Fi • Bluetooth
- Ethernet • Silver magnesium chassis
- AMD Radeon HD 7600G Graphics
- HDMI • Only 2.3kg
- Windows 8.1 OS

Part Code: 41583

NOW ONLY
£269.96

BARGAIN!

PLUS! AN EXTRA 10% DISCOUNT
 Buy any of these products and claim a special MicroMart readers **ONLY** extra 10% discount!

Go to our website and place your order for any of these superb offers. Enter your special promo code **MMTEN** at the checkout online and see your order reduce by an extra 10%!

E.&O. All trademarks are acknowledged. Prices are subject to change without notice. Our terms and conditions of trading apply. Copies are available on request.

All Prices include VAT
 Monday to Friday
 8.30AM TO 6.00PM

MorganComputers



SUPERB MORGAN BARGAINS • WITH EXTRA 10% DISCOUNT!

LENOVO THINKPAD T520 15.6" LAPTOP



IBM
lenovo
ThinkPad



WINDOWS 7 HOME PREMIUM, BIG SCREEN BIG SPEC - LOW PRICE!

As new top quality! This full size laptop has almost everything. 15.6" HD LED Screen, 2.5GHz 2nd Gen i5 Processor, Webcam, Windows 7 with a FREE upgrade to Windows 10 when released. Sold with a 12 month warranty for total peace of mind. Will satisfy the most demanding & fastidious customer!

- Processor: Intel Core i5 (2nd Gen) 2520M
2.5 GHz (3.2 GHz) / 4 MB Cache
- Memory: 4 GB DDR3 ● Storage: 320 GB HDD
- Display: 15.6" LED backlight 1600 x 900 / HD
- Graphics: Intel HD Graphics 3000
- Networking: Wireless, Ethernet, fax / modem, 3G upgradable
- WebCam: Built-In ● Weight: Only 2.5 kg
- Size: (WxDxH) 37.3 x 24. x 3.6 cm ● OS: Windows 7

**SPECIAL NEW PRICE
WITH AN EXTRA
10% DISCOUNT**

NOW ONLY
£269.06

APPLE iPhone 4S 16GB BLACK 60% LESS THAN RRP! Refurbished & Unlocked Ready for any Network SIM card!

Use on any of
these networks



.. and
many
more!

With 12 Month Warranty

- Dual-core 1 GHz Cortex-A9 processor ● 3.5" LED-backlit IPS LCD, capacitive multitouch touchscreen with 640 x 960 pixels and 16M colors ● 8 MP, HD 3264 x 2448 pixels, autofocus, LED flash primary camera ● VGA, 480p@30fps, videocalling over Wi-Fi and 3G ● Wi-Fi
- Bluetooth v4.0 ● Accelerometer, gyro, proximity & compass sensor ● GPS with A-GPS & GLONASS ● Up to 14Hr Battery Life (2G talk time) ... and much more

**SPECIAL NEW PRICE
WITH AN EXTRA
10% DISCOUNT**

NOW ONLY
£161.96

RRP AMAZON
~~£409.95~~
 **wiFi 16Gb**



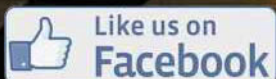
**PRICES
SHOWN**

INCLUDE AN EXTRA 10% DISCOUNT

Buy any of these products and claim a special
MicroMart readers only extra 10% discount!

Go to our website and place your order for any of
these superb offers at our standard discount price.
Enter your special promo code **MMTEN** at the checkout
online and see your order reduce by an extra 10%!

E&O. All trademarks are acknowledged. Prices are subject to change without notice. Our terms and conditions of trading apply. Copies are available on request.



www.morgancomputers.co.uk

Or Call FREEPHONE 0800 008 7451

**All Prices
include VAT**
**Monday to Friday
8.30AM TO 6.00PM**



Should You Get A Drone

David Crookes looks at these popular flying devices, including the many ethical and legal problems they pose

A few weeks before Christmas, a photojournalist called Georgine Benvenuto attended an event at a bustling TGI Friday's restaurant in New York. Staff were showing off their latest toy, a high-tech quadcopter, or drone as they're more commonly known, and one enthusiastic member was attempting, with great gusto and ambition, to land one on a fellow hack's hand.

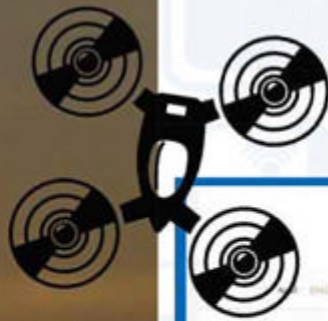
The drone was the same type that had, a few weeks earlier, been flying over the heads of diners in a TGI next to Manchester's Royal Exchange Theatre, encouraging couples to kiss under an attached piece of mistletoe and have their special moment captured on cameras. Only in New York the love was in short supply, as the intending landing site swiped the drone away and sent the contraption

flying into Ms Benvenuto's face. "It was like I couldn't get it off because I guess the mistletoe part had fishing wire on it – that's how it was attached – and it got caught in my hair and it kept twirling and twirling and twirling while this thing is on my nose," the Brooklyn Daily snapper told NYMag, as the blades cut her under her chin. "It literally chipped off a tip of my nose," she said.

Over the past few years, drones have become increasingly popular thanks to lower prices, greater awareness, better methods of

control and the ability to use them in combination with a smartphone or tablet. They are the slick successors to the radio-controlled model aircraft, which hobbyists manoeuvre using a handheld radio transmitter to communicate with an on-board receiver. Only the drones are much more useful. Quite aside from gimmick-driven incidents such as that at TGI Friday's, thousands upon thousands of drones are taking to the air in complete safety and in doing so they're showing a great potential to be revolutionary.

“ Drones are revolutionising the way journalists are reporting stories ”




Drones are having an impact in film. The scene where James Bond chases a bad guy across the rooftops of Istanbul in *Skyfall* was largely shot using a camera-packing drone. There have been similar scenes filmed in this way in *Man of Steel*, *The Dark Knight Rises* and *Iron Man*. The BBC is using drones to gather footage that would be difficult or impossible to film from the ground, negating the use of a full-sized helicopter and saving on manpower and bulky equipment.

Indeed, drones are revolutionising the way journalists are reporting stories (even if, as the TGI incident shows, they can sometimes become part of the news themselves). The Daily Telegraph's visual journalist Lewis Whyld designed and built his own drone and used it to capture the floods in Somerset last year. He even used it to check that nobody had become trapped in a submerged car.

And, of course, you will have heard the news last year that Amazon was

looking to put quadcopters – drones with four propellers – through their paces with a view to using them for deliveries. By testing the eighth generation of its Prime Air drone, it aims to use the tech to deliver parcels from its distribution centre to customer doors without any need for third-party intervention at some point in 2015. This whole idea also looks set to take off (literally), since Domino's Pizza has also been trialling drones as a neat way of getting a stuffed crust meat feast to hungry customers. It's not pie-in-the-sky thinking either, since DHL has already beaten these guys to the punch by becoming the first delivery firm to make deliveries by 'parcelcopter', using one to send medication to an island in the North Sea.

But should you get one yourself? It's a question many lovers of technology have been asking, debating whether drones are merely a craze or something viable and useful. The answer, as always, depends very much on how you may want to use one. Which brings us to a few reasons why you shouldn't bother. They're still quite expensive if you want the best kit, they can be dangerous if you don't control them properly, and the law hasn't worked out what's legal or not. Yet there are so many more reasons why you should bother, the

primary one being that they're just great fun. If you get yourself into an open space, you can have a blast with a quadcopter. But first let us look at the law just so we're clear what can and can't be done.

Law Of Drones

In the UK, the rules are set down by the Civil Aviation Authority, and its air navigation order states that drones are unmanned vehicles and, so:

- Drones have to be less than 20kg unless you're in a specific area of the UK such as Parc Aberporth aerodrome in West Wales.
- Regardless of weight, permission is needed from the CAA if you plan to fly the aircraft on a commercial basis or fly a camera/surveillance fitted aircraft within 150 metres (492 feet) of a congested area or close to people or properties.
- Permission will only be granted if you can show that you are a competent operator, so you may want to get some practise in first.
- The CAA doesn't give hard and fast specifics for gauging this, but it can be expensive, as we'll see later.
- Drones cannot be flown over airports, high-security prisons,

- military sites or nuclear power plants.
- Drones with a camera always have to remain at least 50 metres (164 feet) away from a person, building, structure or vehicle.
- The drone has to remain within the line of sight of the operator. The CAA measures this as around 500 metres (1,640 feet) horizontally or 122 metres (400 feet) vertically.
- Drones have to be less than 20kg unless you're in a specific areas of the UK such as Parc Aberporth aerodrome in West Wales.

Yet the rules are constantly 'evolving' as the CAA gets to grips with more people using them. At the beginning of March, it came to light that a loophole in the CAA rules meant that it was legal to operate drones over royal and

government sites. Reports pointed out that it was possible to fly over the Balmoral and Sandringham estates or swoop over Chequers. Drones can even be flown over GCHQ in Cheltenham. The rules can be expected to be tightened up as a result of these finds and, indeed, consideration is being given to ensuring all civilian drones are registered, with some going as far as saying that drones need to be programmed so they automatically stay away from sensitive locations (a situation that, unfortunately, would no doubt be swerved by hackers).

Operators have to consider other laws too. According to the Information Commissioner's Office, there are many privacy concerns, and users have to consider that drone fitted with a camera may fall under the rules of the Data Protection Act (unless it's being used domestically or for journalism, literature and art). The ICO says operators should let people know if they're going to be recording and to consider the surroundings. It also suggests planning flights and getting to know the camera in detail, looking at the power of the zoom and the element of control you have over it once it's in flight. It also asks operators to think carefully before images are shared and to keep them safe. None of these are hard and fast laws, though.

Certainly, there are no rules to indicate whether flying over someone's property is trespass, which means much is being left to the discretion and common sense of the operators at the moment. And it's easy to unwittingly fall foul of the law, as TV-repair shop owner Robert Knowles from Barrow-in-Furness noted when he became the first person to be convicted in the UK for dangerously flying a drone within 50 metres of the Jubilee Bridge on the Walney channel and was fined £800 and ordered to pay £3,500 costs as a result.

Faced with such a possibility, some drone owners are checking their insurance to see if it covers them for liability should something go wrong. Gerry Bucke, general manager of the insurance broker Adrian Flux, says, "Some of the bigger drones on the market, which still only sell for a few hundred

The screenshot shows the BBC News Europe website interface. The main headline is "Paris drones: New wave of alerts" with a sub-headline "Ten more drones have been spotted flying over Paris and reports say police are searching for four men after a chase in the east of the city." The main image shows a drone flying in the sky with the Eiffel Tower in the background. To the right, there are sections for "Top Stories" and "Features".

Attack Of The Drones

Paris has understandably been quite jittery in recent months following January's Charlie Hebdo attacks. So when reports emerged of a spate of mysterious drones flying around important Parisian landmarks, it caused some concern. There have been sightings over 17 nuclear power plants and a nuclear submarine base, and it has raised speculation that terrorists will one day use drones to launch an attack.

Fears that a drone laden with explosives or toxic chemicals could be used for such a purpose follows several reports of near-misses between aeroplanes and drones. Last December, a drone was said to have passed 20 feet over the wing of an Airbus A320 that was 700 feet from landing, and a confidential report by British nuclear expert John Large said there were issues surrounding the use of drones around the 16 operational reactors in the UK. Of course, all this is quite apart from the military drones that are used in modern warfare, which is a different story entirely.

There are also concerns that drones are being used to monitor populations. Police forces are already using them, and the United States employs drones to patrol its borders. Some residents are also hitting out at their neighbours' drones, saying they're being used to spy on their properties and themselves and pointing out the potential danger in stalking cases. Photos taken with a drone can so easily find themselves on social media.

It is no surprise, then, that a mini-industry has risen up to combat drones. One company is planning to use a hunting drone to drop a tangle-line onto an offending drone and prevent it from flying. The idea is that it will prevent people from snooping, although there will undoubtedly be a legal grey area as people object to their property being potentially damaged.

Good

Fujitsu Siemens Esprimo E5731

Refurbished Desktop PC, Intel Core2Duo E7500
2.93GHz, 2GB Memory, 250GB HDD, DVDROM
with Windows 7 Professional

£99.99

SKU: DFU57311329225H5000



Core 2 Duo
2.93GHz



2GB
Memory



250GB
HDD



DVDROM
Drive



10% OFF

any purchase
with the
discount code

17V31L

Valid 12th March -
15th April

Better

Dell Latitude E4310 Laptop

Intel Core i5 2.67GHz, 4GB Memory,
250GB HDD, 13.3" Screen, DVD-ROM with
Windows 7 Professional Refurbished Laptop

£199.99

SKU: LDE43101626425H3W0C



Core i5
2.67GHz



4GB
Memory



250GB
HDD



DVDROM
Drive



Best

HP Compaq 8200 Elite SFF PC

Refurbished Desktop PC, Intel Core i5 2500
3.30GHz, 4GB RAM, 500GB HDD, DVD-ROM
with Windows 7 Professional

£274.99

SKU: SHP82001633450H3000



Core i5
3.30GHz



4GB
Memory



500GB
HDD



DVDROM
Drive



For all the latest deals,
visit www.refurbthat.com
or call 01670 732 502

9:00 - 17:30 Mon-Fri exc Bank Holidays



Microsoft
AUTHORIZED
Refurbisher

RefurbThat[®]
Powered by Trust

Performance without compromise



Infinity 7850K

- AMD A10-7850K APU
- ASUS® A88XM-PLUS
- 8GB HyperX FURY RAM
- Integrated AMD Radeon™ HD 8000
- 2TB Hard Drive
- **Windows 8.1**
- 3 Year Standard Warranty

THIS SPEC FROM **£499***



Vanquish HAF III

- Intel® Core™ i5-4590
- ASUS® H81-Gamer
- 8GB HyperX FURY RAM
- 2GB NVIDIA® GeForce® GTX 960
- 120GB Kingston SSD
- 1TB Hard Drive
- **Windows 8.1**
- 3 Year Standard Warranty

THIS SPEC FROM **£769***



Minerva

- Intel® Core™ i5-4690K
- ASUS® RoG MAXIMUS VII RANGER
- 16GB HyperX FURY RAM
- 4GB NVIDIA® GeForce® GTX 970
- 120GB Kingston HyperX 3K SSD
- 2TB Hard Drive
- **Windows 8.1**
- 3 Years Warranty

THIS SPEC FROM **£999***



Predator X99

- Intel® Core™ i7-5820K
- ASUS® Z99-S
- 16GB HyperX FURY RAM
- 8GB AMD RADEON™ R9 295X2
- 240GB HyperX 3K SSD
- 2TB Seagate SSHD
- **Windows 8.1**
- 3 Years Warranty

THIS SPEC FROM **£2,299***



Optimus V Exige

- Intel® Core™ i7-4710MQ
- 17.3" Matte Full HD LED
- 16GB HyperX IMPACT RAM
- 2GB NVIDIA® GeForce® GTX 860M
- 240GB Kingston SSD
- 1TB Hard Drive
- **Windows 8.1**
- 3 Year Standard Warranty

THIS SPEC FROM **£799***



Defiance 17

- Intel® Core™ i7-4720HQ
- 17.3" Matte Full HD LED Screen
- 16GB HyperX IMPACT RAM
- 4GB NVIDIA® GeForce® GTX 980M
- 240GB Kingston SSD
- 1TB Hard Drive
- **Windows 8.1**
- 3 Year Standard Warranty

THIS SPEC FROM **£1,349***

Order your system now with PC Specialist



pcspecialist

Award winning custom PC & Laptop manufacturer

Get a PC that's more **you**



Vortex 440

- Intel® Core™ i7-5820K
- ASUS® Z99-S
- 16GB HyperX PREDATOR RAM
- 4GB NVIDIA® GeForce® GTX 980
- 240GB Kingston HyperX 3K SSD
- 2TB Hard Drive
- Windows 8.1
- 3 Year Standard Warranty

THIS SPEC FROM **£1,599***

Quality builds at a low price
Always

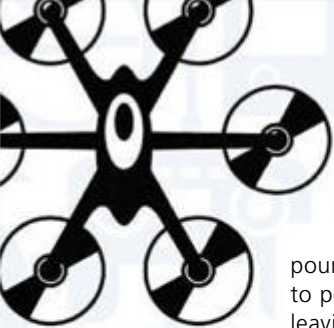
GET A FURTHER £15 OFF WITH THIS EXCLUSIVE VOUCHER CODE:

MM49T

ORDER ONLINE NOW

0333 011 7000

www.pcspecialist.co.uk



pounds, can cause serious injury to people and damage to property, leaving the user open to significant claims for damage. So we'd urge everyone to check their liability cover under their home insurance policy to ensure they're covered in the event of an incident." With all that in mind, let's look at some of the things you can use a drone for, starting with the taking of photos.

Photos In The Sky

Amateur photographers will love the freedom a drone gives and the incredible aerial shots that can result from strapping a camera to a quadcopter and sending it high into the sky. Drones come in two flavours for those interested in images: quadcopters with a built-in camera and, for better results, those that allow you to attach a separately purchased GoPro camera.

GoPro is a make of high-end, high-definition personal cameras, which have been made with extreme-action video photography in mind. Its

success has meant that, like Hoover, GoPro has become a generic name used for any camera that is rugged, small and attachable. There are some distinctive traits such as the cameras' wide, fish-eye lenses, but the sharp image opportunities offered by the persistent first-person perspective has made them the go-to cameras for those who enjoy using drones.

Some of the higher-end drones will include image stabilisation for less migraine-inducing footage, and the videos will be sent directly to a smartphone or tablet so you can instantly see what's being filmed and adjust the drone for a better shot. It's important to think about the range; you don't want to suddenly lose reception as you're gearing up for a great shot just because you've lost sight of your drone's distance, but equally you should think about the battery life. Lots of streaming and flying can seriously drain the juice so look out for the manufacturers' claims and read reviews before stumping up.

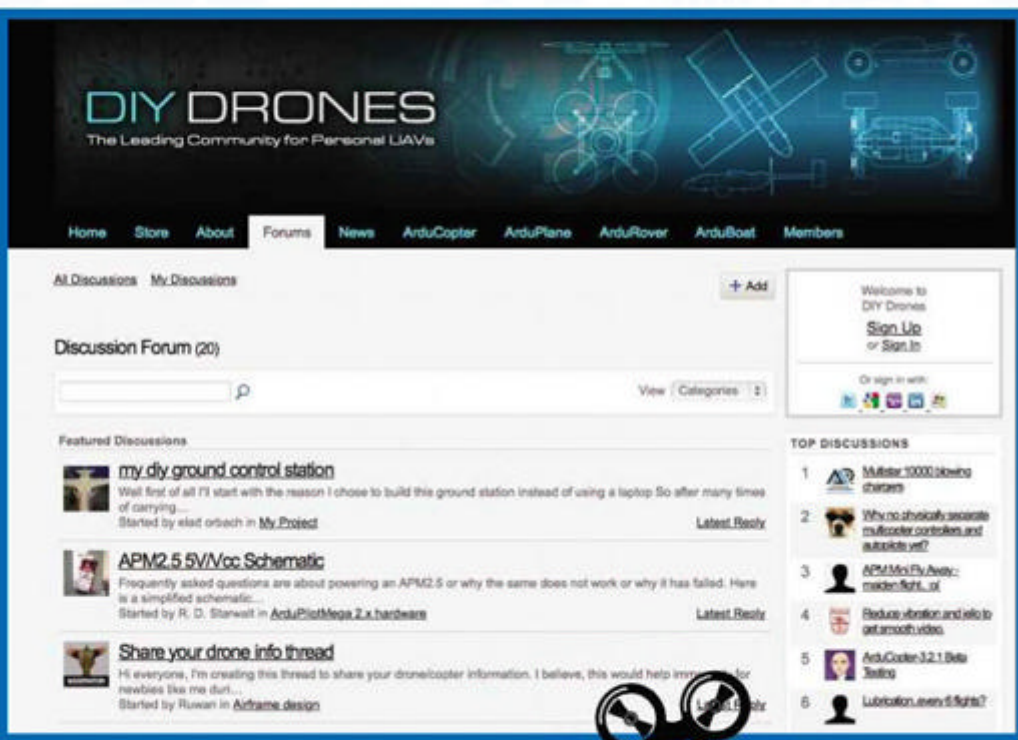
If you become particularly adept at taking photos via a drone, then you may consider going pro and charging for the photos. As we saw earlier, you would have to get permission from the CAA and it's not cheap: anyone running an aerial photography business would be expected to embark on a Ground Course and Theory Examination, which is run over two days by EuroUSC and costs £840. After that, an operator has to stump up £420 for an Operational Assessment and Flight Operations Examination. Of course, if you just want to take a drone – the drone equivalent of a selfie – you can keep your cash firmly in your wallet.

Doing DIY

Certainly, for domestic use, the operation costs are very low, and drones could actually save you money and hassle in the long-term. Although rich people have been known to fly drones around their sprawling estates to keep an eye on their belongings, DIYers have also been known to use a drone's camera to check out their own property and spot potential problems that may need fixing. Householders can also use drones to check workmanship and spurious claims that work needs to be carried out. By sending a drone above your house, it's possible to check for loose tiles, blocked guttering and chimney wear.

And while it may not be entirely safe if you're subsequently perched on a pair of ladders, a drone could be used to send essential equipment up to you, with the aid of a helper down below. This kind of thing has not escaped the bean counters either. Some housing associations are already using drones to help them manage their homes, saving themselves a bob or two in the process. Halton Housing Trust and Bromford, for example, has trialled the use of drones to inspect roofs, which allows them to retain tens of thousands of pounds that they would otherwise spend on scaffolding, while negating the need to send people up to take photos of potential repairs. Nick Atkin, the chief executive of Halton, says the drones and their cameras are particularly great for investigating roof leaks.

“ Rich people have been known to fly drones around their sprawling estates to keep an eye on their belongings ”



FROM BEDROOMS TO BILLIONS

OUT NOW!
ONLY AT FUNSTOCK.CO.UK

THE DEFINITIVE STORY OF THE UK VIDEO GAMES INDUSTRY



> JON HARE
> SENSIBLE SOFTWARE

> DAVID PERRY
> SHINY ENTERTAINMENT/
GAIKAI

> JEFF MINTER
> LLAMASOFT

> IAN LIVINGSTONE
> FIGHTING FANTASY SERIES

> DAVID BRABEN
> FRONTIER DEVELOPMENTS

> DAVID DARLING
> CODEMASTERS

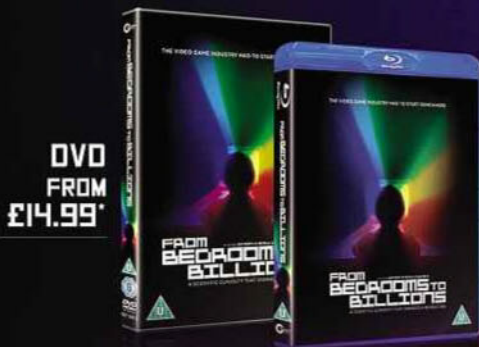
> PETER MOLYNEUX
> POPULOUS /
DUNGEON KEEPER

> PHIL HARRISON
> MINDSCAPE / MICROSOFT

> MATTHEW SMITH
> MANIC MINER

- In-depth documentary film running at over 150 mins!
- Brand new interviews with the leading game developers and creators
- Spans the history of gaming and the industry it created
- Never seen before footage and rare archive content
- Original soundtrack composed by famous artists from the era
- 'Special Edition' includes 18 exclusive 'making of' and special features including another 150 minutes of bonus content with:

- The Making of Elite
- The Making of Manic Miner
- The Making of Populous
- The Making of Sensible Soccer
- The Making of Speedball 2
- Making music for the C64 and many, many more!



DVD
FROM
£14.99*

BLU-RAY
FROM
£19.99*



"THE VIDEO GAME DOCUMENTARY FOR ALL
GAME LOVERS, NOT JUST THE BRITISH!" - IGN

"FROM BEDROOMS TO BILLIONS IS A
CAPTIVATING AND DEFINITIVE ACCOUNT
OF THEIR PIONEERING PAST" - THE SKINNY

"IF YOU ONLY BUY ONE INDIE FILM THIS YEAR, OR
INDEED EVER, MAKE IT THIS ONE" - EDGEGEEK

VISIT: BEDROOMSTOBILLIONS.COM TO GET YOUR COPY NOW!

AVAILABLE EXCLUSIVELY AT: **funstock**.co.uk

*PRICES SUBJECT TO CHANGE



“ They can be dangerous if you don’t control them properly ”

Build Your Own

Drones are also giving people a better understanding of technology. In 2012, Universal Air’s R10 Quadrotor DIY Kickstarter project raised \$220,822 despite asking for only \$15,000 and, as you’d expect, the Raspberry Pi is a popular component in a sizeable number of drones. The Owenquad project uses the Pi.AVR Arduino microcontroller as an interface board for the bare bones computer, reading RC inputs and outputting motor control signals, and the Pi allows for some very adventurous programming.

There has also been a rise in the number of companies selling relevant components to people to encourage them to build their own. This is backed up by scores of online communities discussing the best techniques. One of the most popular platforms is ArduCopter, which is well used among the DIY Drones community, which has more than 50,000 members. It allows for mission planning and real-time telemetry, which means the operator does not have to constantly control it. The drone is also easy to fly because it has auto-leveling and auto altitude control.

For hobbyists, this kind of thing is a dream, but it’s also helping business and organisations. Farmers are able to map out specific flying paths to monitor their crops; forest managers can do the same with trees. Estate agents are able to create aerial shots and minimise the risk of crashing into a property.

Game Of Drones

Of course, there are lots more fun things you can do with a drone. Some drone owners have taken to racing their devices, with one set of hobbyists in New York going one step further and linking the on-board cameras with a set of special glasses so they get a first-person view of the race. Enthusiasts in France have been doing something similar in the Argonay woods in a move some have

compared to the speeder chase in *Star Wars: Return of the Jedi*.

Since the drones can go at up to 70 miles-per-hour, this kind of things needs a lot of space and much care and attention, but the proponents of it are so convinced of its exciting nature that they believe drone racing could one day become a sport. And if you prefer things to be a little more sedate, then you may want to take a cue from a recent episode of *The Gadget Show*, which puts one to use as personal trainer, which not only gave presenter Jason Bradbury some encouraging words but fired at him when he slacked off.

The belief that drones are a force for good is a deeply entrenched one. An initiative has been set up called Drones for Good in the United Arab Emirates, which is running across the world and aims to find exciting technologies, which will make a positive difference to people’s lives. Some of the ideas include a thermal-imaging drone to catch vandals on German railways, monitoring endangered animals and providing disaster relief. But they also go as far as pet drones that follow the user around and waterproof quadcopters, which could prove handy for accompanying sailors – both amateur and professional – on their voyages.

What it shows is that there are so many possibilities surrounding the use of drones, which are either being explored today or will be at some point in the future. And far from being toys, drones have the capability of being very useful tools for mankind. This is also a good time to buy one. The restrictions placed on drones are not as draconian as they may well be if they become much more commonplace, so it gives people a golden opportunity to experiment and try out drones with all of the potential for innovation that brings. As long as users stick to the CAA guidelines and are sensible when flying drones, the authorities should hold out for a bit longer on tighter regulations. [mm](#)

iiyama monitors

New iiyama products for March 2015



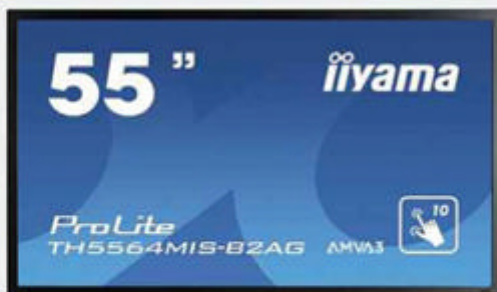
ProLite X2481HS

Slim bezel monitor with 3 000:1 static contrast, ideal for multi monitor setup.



ProLite XB2481HS

Slim bezel monitor with height adjustable stand and 3 000:1 static contrast, ideal for multi monitor setup.



ProLite TH5564MIS-B2AG

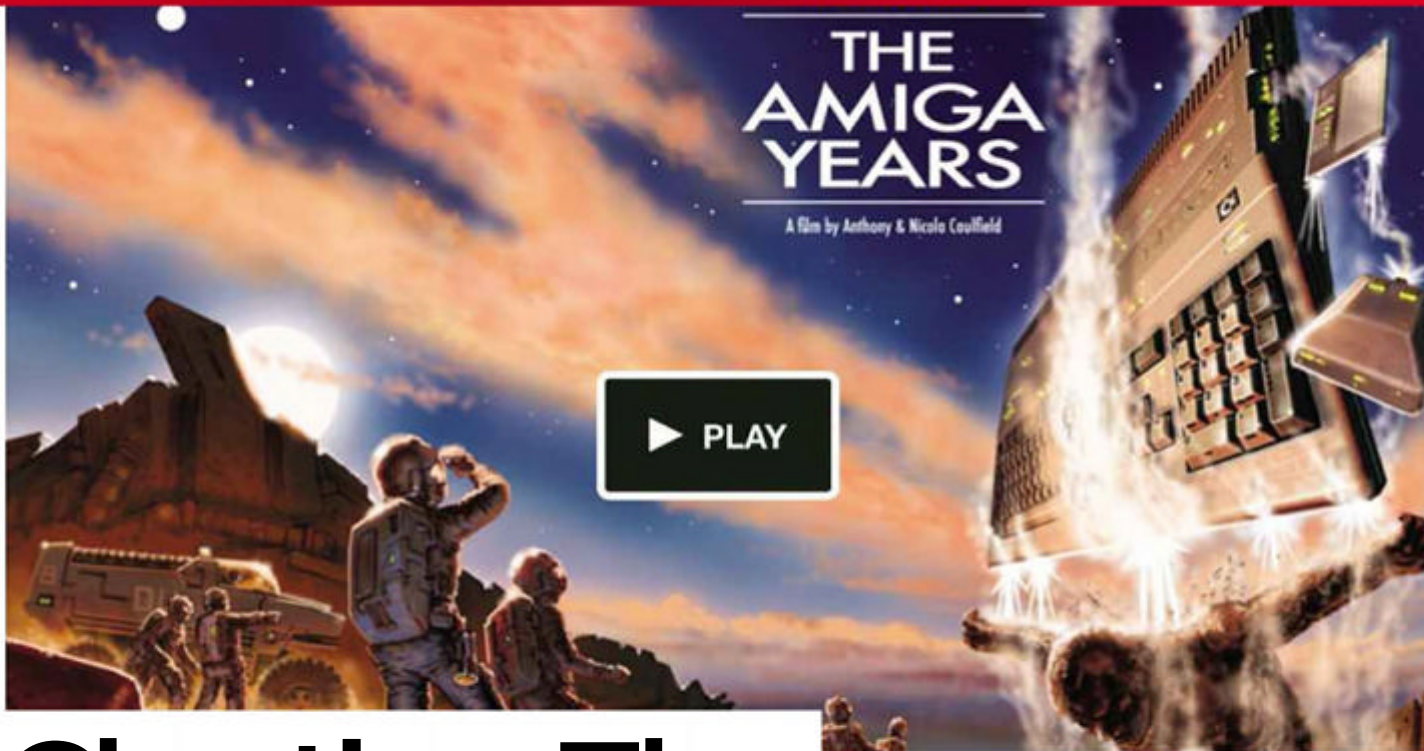
Professional large format Full HD display featuring IPS panel, 10 compatible touch points and AG-coating.



ProLite TH6564MIS-B2AG

A professional display with 10pt IR touch technology, VA panel and AG-coating; ideal for educational needs.





Charting The Amiga Years

Anthony and Nicola Caulfield are fundraising for their new film, telling the story of the rise and fall of the Amiga. They've been telling us about it...

Anthony and Nicola Caulfield's film, *From Bedrooms to Billions*, charted with some skill the rise of 8-bit computing, documenting how the British gaming industry sprang up and generating games that still resonate today. It's available now on DVD, Blu-ray and download.

"When we were making the original film," Anthony told us, "we focused on key machines. Commodore 64, Spectrum, BBC. When we got to the part of the film where 16-bit machines became available, we wanted to cover the Atari ST, the Amiga and the Archimedes. But we realised we were at a two-hour running time, and no matter how hard we tried, we didn't feel we could do it real justice."

The British gaming industry, after all, was changing in the late 1980s. As Anthony put it, a "third wave" of developers was entering the market, and ultimately, it was the Commodore Amiga that was at the heart of that. So when it came time to decide on the next film, the Caulfields knew that it had to be Amiga-

centric. And thus, they're crowdfunding for their new movie, *From Bedrooms to Billions: The Amiga Years*.

The Caulfields have more than the usual emotional attachment to the Amiga too. They met over Amiga games and have been together for 20 years since. "He wooed me with his Amiga," Nicola recalls. Presumably they celebrate their anniversaries playing *Stunt Car Racer* then. "It's rock and roll here!" laughs Nicola.

So why Amiga rather than ST? "When we were shooting *From Bedrooms to Billions*, we had over 100 interviews," Anthony said. "And people would say the same things to us time and time again. They were always saying Amiga, not the ST." And with the Amiga celebrating its 30th birthday this year, it seemed ripe for exploration.

Not least because the Amiga story had a very pronounced beginning, middle and end. The demise of the Amiga was tied to the seemingly sudden collapse of Commodore, from which it never really recovered. So while *The Amiga Years* film



will talk about the games, it'll also cover the story behind them. It will also cover, inevitably, the impact of the infamous Batman Pack, which really helped the Amiga make a huge impact in the UK. "You won't believe how many people how referenced that Batman pack," laughs Anthony. "It must have come up 200 times so far."

The Kickstarter is live now, and we've put a few pounds behind the project ourselves. You can find our more information at its website, here:

kck.st/1BICffZ.

And if this one goes as well as the last, the Caulfields may well then complete a trilogy of classic gaming documentaries... **mm**

supplying quality refurbished **computers, laptops & peripherals**

Get the latest tech at affordable prices.

FREE
NEXT DAY
DELIVERY



FROM
£79.99

Lenovo T410

- Intel i5 2.4Ghz Processor
- 4GB DDR3 Memory
- 320GB Hard drive
- Windows 7 Pro 64BIT



£150
ex VAT

HP 8100 Elite SFF

- Intel i5 3.2Ghz Processor
- 4GB DDR3 Memory
- 250GB Hard drive
- Windows 7 Pro 64BIT



£179.99
ex VAT

Lenovo X201

- Intel i5 2.4Ghz Processor
- 4GB DDR3 Memory
- 320GB Hard drive
- Windows 7 Pro 64BIT



£145
ex VAT

Call us today on
0161 745 9720
or visit **www.gigarefurb.co.uk**

All our products come with
1 year warranty



When **Mice** Do Not Suffice

Not everyone gets on with a traditional PC mouse, so we've been looking at what alternatives are available

Ever watch a movie or TV show where the characters use a computer with great efficiency without ever touching a mouse? It looks odd, because it so distinctly contradicts most people's everyday experiences of using a PC. You want to open something, you click on it. You want to move something, you click and drag. It's fast, it's efficient and it makes sense. In fact, mice are such an integral part of how we use computers, it's hard to imagine doing otherwise. But that's exactly what people did for decades.

The mouse wasn't invented until the 1960s, and it wasn't until the 1970s that one was famously used with the Xerox Alto computer. Before that, everything would be done with a keyboard, but that was fine when we didn't have graphical interfaces to deal with. Once we went from plain text to icons and windows, the mouse became pretty much a necessity.

But not everyone is a fan. Some people find the action of using a mouse uncomfortable; others need something they can use on the move, where a suitable flat surface isn't always easy to find; and some people would rather not move their hands away from their keyboard and instead would rather learn a huge number of keyboard shortcuts – just like in the movies.

If you're one of those people, in search of the ideal substitute for a mouse, then you're in luck. We've

been looking at what choices you have when it comes to alternative pointing devices, and at least one of them won't cost you a penny. (Note: for the sake of simplicity, prices are approximations of what is available online. Do shop around to possibly find better deals.)

Trackballs

Essentially a ball mouse turned upside-down, trackballs enable you to move your cursor by rolling a sphere with your fingers and usually clicking the buttons with your thumbs. Some swap this around, but the principle is the same, and both designs have similar key advantages. At the top of that list is the simple fact that you don't have to move your arm or wrist when using it. The physical movements associated with regular mice can cause discomfort and potentially lead to repetitive strain injuries, and trackballs have been known to ease or even eliminate this problem. Another key advantage is the fact they require very little space to use, because they don't have to be moved around. This makes them perfect for laptops, where you often don't have anywhere to put a regular mouse.

1. Kensington Orbit Scroll Ring Trackball – £25

Kensington produces a range of trackballs, and this one is its second cheapest. The reason you'd go for

this one is the inclusion of the scroll ring, which makes viewing web pages and so on far more enjoyable. From our own experience, we can tell you right now that using a trackball without a scrolling feature of some sort is a nightmare.

The Orbit Scroll Ring Trackball is a fairly standard ambidextrous, two-button design, which uses an optical sensor to read the movements of the ball, and the wrist rest area should ensure a greater level of comfort. It's a simple, affordable product, and apart from a lack of browser back and forward buttons, it has everything you need.

If you want a wireless peripheral, then check out the Orbit Wireless Mobile Trackball, which costs £10 more.

2. Kensington SlimBlade Trackball – £65

From the cheap to the luxury, let's turn our attention to Kensington's top-of-the-range trackball. What you get for over £100 is a device with dual laser sensors for extra precision and a bunch of features not present on the cheaper trackballs.

For a start, you have access to media control functions, such as volume, play and pause, which you can switch to by twisting the ball.

On top of that, there are four buttons, rather than the usual two, and these can be set to whatever



functions you want, including keyboard shortcuts. Also, the general shape of the base should provide decent support for your wrists to minimise physical strain.

With something this expensive, you have to be pretty dedicated to not using a mouse, but if you make this investment, it's likely to be one that will last you for several years. Still, it's recommended you give it a try first, before laying down this kind of cash. Also, consider Kensington's slightly cheaper, less fancy Expert Mouse Optical Trackball, which has a similar level of functionality.

3. Logitech Wireless Trackball M570 – £35

In contrast to most trackballs, the M570 has you move your mouse pointer with your thumb, leaving your fingers to clicking and scrolling duties, as they would be with a normal mouse. To accommodate this design, the browser back and forward buttons are also the responsibility of your fingers, which might take some getting used to. You might also find using the trackball with your thumb less intuitive than with your fingers, but ultimately that's a matter of personal preference and something that you may be able to adjust to.

Because it's a wireless device, it's ideal for using with a laptop or even

a tablet, because you don't have deal with wires running all over the place.

Trackpads

Because mice aren't really suited to computing on the move, laptop manufacturers have found other ways for us to move things around our screens. One of those is the little red pointing stick (aka the 'nipple') used in ThinkPad notebooks, but far more common is the trackpad. These touch-sensitive devices enable users to quickly and easily interact with their computers, in a way that is space efficient and intuitive.

Their quality can vary hugely, with some being unresponsive or inaccurate, but a good one can be a godsend. Bearing that in mind, it's no surprise that this control system is now available for desktop PCs too. Just like trackballs, they don't require much space (although you'll usually need to put them on a solid, flat surface for the click function to work), and they also offer the user swipe-based controls and shortcuts, as well as the kind of pinch controls that will be familiar to smartphone and tablet owners.

4. Apple Magic Trackpad – £42.99

If there's anything magic about this, it's the fact that Apple is able to charge £59 for it (if you buy from the Apple

store). But that's Apple for you, and it's either something you accept or you don't. If you're willing to pay the Cupertino premium, though, what you get is a high-quality, multi-touch, Bluetooth trackpad, with a mechanical click, as well touch clicking. There's just one small problem: it's designed to work with Mac OS X, not Windows.

Thankfully, though, Windows users don't have to be left in the cold. Head to www.trackpadmagic.com and you can buy a third-party driver that will enable you to use the Magic Trackpad and customise its functions. It costs \$7.90 (£6.71 with VAT), but you can try it out with unlimited functionality for 28 days before making a purchase. With this program you can access features such as tap to click and two-finger scrolling.

5. Logitech T650 Wireless Rechargeable Touchpad – £21

Interestingly, although Logitech's T650 trackpad is available online for around half the price of Apple's product, the RRP is actually more: £69.99 from www.logitech.com. Clearly, you'd be crazy to pay that much for it, but for around £20, it's a bona fide bargain.

It's marketed as being designed for Windows 8, taking advantage of that operating system's emphasis on touch controls, but that doesn't mean you can't use it with other

versions of Windows, so it's a worthwhile product, even if you don't have Microsoft's divisive OS installed. It's a simple plug and play unit, which uses its own 2.4GHz wireless technology, rather than Bluetooth, so be careful not to lose the tiny USB dongle that's included. The main advantage of this is you don't need to worry about messing around with pairing processes.

It also claims to have a month-long battery life on a single charge. Whether or not that's true, it's a good alternative to Apple's product, with the advantage of being designed to work with Windows.

Pens & Graphics Tablets

They say the pen is mightier than the sword, but how does it stand up against the mouse? Certainly the action of gripping a pen is comfortable enough that we've been happily doing it for thousands of years, so it makes sense that peripheral makers have considered adapting it for use with computers. The graphics tab, for example, will be a familiar product to anyone who's worked in publishing and other creative industries. A two-part system, graphics tabs are made up of both the tablet itself and a pen device, and you usually need both for them to function. But you can also buy pen-based pointers that work independently, without a tablet. Both types are worth considering if you want an alternative to mice.

6. Wacom Bamboo Pad Touchpad – £20 (£25 for wireless version)

Although it's not the only name in the game, when it comes to graphics tablets, Wacom is undoubtedly a

market leader. It has an impressive line-up of products, with prices that go up to several thousand pounds, but those are professional devices, meant for designers. If you want something simply for navigation rather than for drawing and writing, the Bamboo Pad is perfect.

It's essentially just a trackpad, and it supports all the usual finger gestures and controls you'd expect such as pinch-zoom and two-finger scrolling, but the stylus offers you an alternative mode of control, should you want to use it. You won't get anywhere near the kind of accuracy from this as you would from one of Wacom's more expensive products, but it should be enough for general tasks.

If you do require something more accurate, then check out the rest of Wacom's product line.

7. Generic Pen Mouse – £8

Type 'pen mouse' into Google Shopping and you'll be greeted with a long list of pen-shaped computer peripherals, which all have different names but that also all look practically the same. No doubt they're all made in the same Far East factories and then

branded by their resellers. We can't comment on their quality, having never tried one, but for such a low price, they're probably worth the gamble.

Taking a typical example from Amazon.co.uk, branded 'Andoer', it connects to the included 2.4GHz wireless dongle and is powered by a single AAA battery. It's a bit chunkier than a normal pen, but not huge, and it comes with a stand for you to place it in when not in use.

What it consists of is basically an optical sensor stuck on the end of a pen, with the mouse buttons and scroll wheel at the front, and you move it around like a pen to shift your on-screen pointer. It's a simple idea, and hopefully the angle at which you hold it should prove better for your wrists than a regular mouse.

8. Penclic Mouse – from about £50

There are numerous versions of the Penclic Mouse, some wireless, some USB and also Bluetooth versions. Other than these differences, though, they're pretty much the same in terms of physical design and features, consisting as they do of a pen-shaped controller with a



Special Deal For Micro Mart Readers

tier **1** Online

CALL TO SPEAK TO US
0161 777 1015

www.tier1online.com

£100 Discount!

ONLY **£399**

USE CODE

430DEALMM

ONLINE or CALL

- **Refurbished Lenovo ThinkPad T430**
- **3rd-Generation Intel i5-3320M 2.6GHz**
- **8GB DDR3 RAM**
- **14.1" HD+ Matte LCD Screen, 1600 x 900**
- **240GB Solid State Drive (SSD)**
- **DVD-RW**
- **Integrated 720p Webcam**
- **2x USB3.0, 1x USB2.0, 1x ESATA/Powered USB**
- **Windows 7 Pro 64-bit**



Special Deal For Micro Mart Readers

9



larger base, shaped much like a traditional mouse. Indeed, it's this base that you move around, like you would any normal mouse, but what's different here is that you hold it by its pen-shaped appendage and, apart from the scroll wheel, the controls are also located on the pen. And there's no shortage there, because it has five buttons, so you have left-, middle- and right-click, as well as back and forward. Anything you can

do with a normal mouse, you can do with a Penclis mouse, only more comfortably. So if RSI is a worry for you, this could well be the solution you're looking for. It's pricey, yes, but reviews have generally been positive, so you get what you pay for. Make sure you look at the whole range first before buying one, though, because some of them have features, like a DPI switch, not present in the cheaper models.

Phone & Tablet Apps

If, like the majority of the population, you have a smartphone or a tablet, then you have in your possession a possible alternative to using a mouse. With the right app, you can easily connect your mobile device with your PC and use the former's touch-screen as a makeshift trackpad. And because it's a smart device, you'll have access to far more features than you would with a mouse. You probably won't get hardware buttons, but with everything else these apps offer, you might find you don't miss them that much.

9. Remote Mouse – free (extra features with IAP)

Whether you own an Android, iOS or Windows Phone device, Remote Mouse will provide you with a quick and easy way to control your Windows PC or Mac. For the great price of nothing, you get access to basic mouse features (click, right-click, click and drag, two-finger scroll), as well as the ability to type using your mobile device's keyboard. You can also see all the icons you have pinned to the taskbar or dock, and you can

launch those from the app. This is probably all you really need, but if you want to extend the functionality of the app, then there's a selection of in-app purchases you can make, such as adding media controls, a Spotify remote, a keyboard with function keys and an option to remove advertising. At the time of writing, the most expensive of the IAPs was £1.24. Also, you need to download and run the server software, which connects to the app over your home network.

10. Touchpad – free

It seems increasingly rare for apps to be free without either having in-app purchases or a barrage of in-your-face advertising, but that's exactly what the Android app Touchpad offers. It's a relatively simple bit of software, with a tiny footprint on both your phone and your Windows PC (84KB for the app, 553KB for the server), and it doesn't offer the more advanced features of some other trackpad apps. That said, you do get a surprising amount, including media controls, a keyboard with function keys, two-finger scrolling, and all the usual left and right-click functions. It may be lacking things like pinch-zoom, and its minimalist design of incredibly thin-lined symbols on a black background probably needs a rethink, but considering it's free, you can't really complain.

Touchscreens

Ever since the iPad was first released, the computer world has taken the idea of touch controls and run with it. Now, as well as phones and tablets with touchscreens, we have laptops and even desktop PCs with them too. Of course, if you're going to plug a touch-based monitor into your PC, then it would seem to make sense to get an operating system to suit it. This is where the much-derided Windows

8 can come into its own. Agonising to use with a mouse, Windows 8 revolves, of course, around the idea that you're going to be controlling it with fingers on a screen. But even if you don't have that particular operating system, you can still use touchscreen technology to interact with your computer – and we're not just talking about monitors.

11. HannsG HT231HPB Touchscreen Monitor – £160

When choosing a monitor, you have a huge amount of factors to take into consideration, and whether it has touch functions is just one of them. You also need to take into account things like refresh rate, contrast ratios and so on. There are so different displays we could list here, but it's not within the scope of this particular article to test them or find the best one, so we've taken the HannsG HT231HPB as a typical example of what's available. Reviews have generally been positive, but do look around at the alternatives as well.

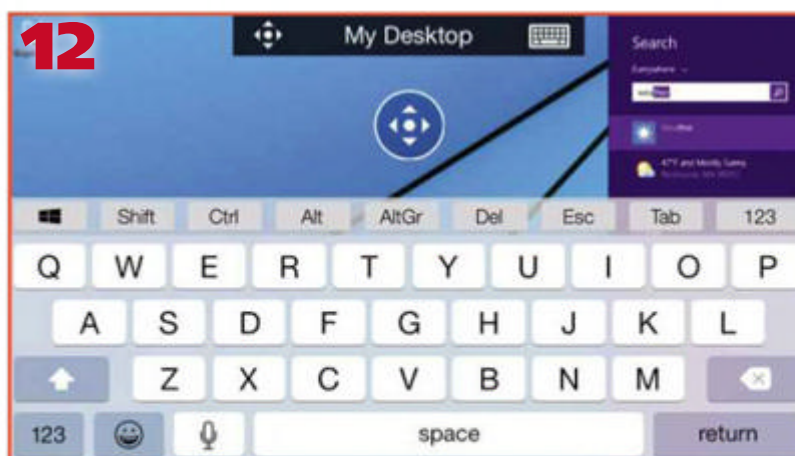
The HT231HPB is a 23" LED display, with a 1080p resolution, a 5ms response time and 80,000,000:

1 ultra-high dynamic contrast ratio. In terms of connectivity, you get DVI, D-Sub and HDMI, as well as a USB port. It supports ten-point touch, so it will certainly have no trouble with regular gestures, like two-finger scrolling and so on, and its high degree of tilting ability makes it perfect for comfortably operating Windows 8 (or any other operating system, for that matter). All in all, it's an excellent monitor for the price.

12. Microsoft Remote Desktop App – free

Remote access software allows you to see your computer's display output and control it as if you were sitting in front of it. You can do this from another PC or, as we're going to look at now, from a mobile device with a touchscreen. There are myriad apps that do this, but Windows Remote Desktop is worth considering first, because the app is free, and everything you else you need you probably already have in your copy of Windows.

Once it's installed, you can use your tablet or phone's screen to click on things, scroll and do everything



AOC



I2757FM

myPlay



Play it large with the myPlay

Transfer games, photos, films, presentations and documents from your smartphone or other mobile device* in an impressively large size and in Full HD onto the myPlay display with its screen size of 68.6 cm / 27". View content together with your friends, family or colleagues in XXL. Thanks to the myPlay's integrated MHL™ interface (Mobile High- Definition Link) all content from your mobile devices gets "mirrored" onto the monitor – ideal for entertainment, social networking and work. A practical side effect: the mobile gadgets get charged at the same time. When size matters, show it with the myPlay from AOC (I2757FM model).

*Only devices with Micro-USB port conforming to the MHL™ Consortium's standards.



13



14



15

THE WORLD'S FIRST MOUSE WITH NATURAL TOUCH GESTURE

Combine truly natural touch gestures with the precision and convenience of a traditional mouse. Be fully productive with an ergonomic wireless mobile device.

[Click here to order >>](#)

Windows 10 Windows 8 Windows 7 Apple iOS Android

you normally would with your PC, including typing.

It's perhaps not as easy to set up as other apps, though, so you should definitely try out some different ones, such as Teamviewer and Splashtop, which also have the advantage of working with Macs and Linux.

Gestures Control

Thanks to our opposable thumbs and nimble fingers, we humans are able to accomplish great things with our hands, so it shouldn't be surprising that most of our computer peripherals involve using these fleshy appendages. But what about control systems that don't involve touching anything, which track your body movements instead? Well, it's perfectly possible, and you might even already have the hardware you need to do it.

13. Camera Mouse – free

Invented at Boston College, USA, with the aim of helping disabled people use computers, Camera Mouse is a free PC program that enables you to move your mouse pointer using your head. It takes the feed from your webcam, and then you get to click on whichever facial feature you want it to track

(we chose our nose). Then you press either Ctrl or F9 (customisable in the settings) to activate the software, and whenever you move your head, the mouse pointer will follow. If you want it to click, then you can set it up so that lingering on something will activate a left-click. To give control back to the mouse, either press the shortcut key or just move the mouse. It's not really ideal for those who don't need it, but it's fun to play around with anyway.

14. Leap Motion Controller – £60

Wish you could use your hands to interact with your PC without having to touch the screen? Then the Leap Motion Controller could be for you. This small block of tech wizardry sits on your desk in front of your PC and senses and tracks your hand and finger movements. Pinch-zoom, swiping gestures – they're all possible. And it claims to be so accurate that it can even track the tip of a pen or pencil. The idea of being able to control your computer with your hands is certainly intriguing (if not also a bit exhausting), so it's well worth considering this gadget, but bear mind that reviews of it seem to differ wildly, with some declaring it a revelation and others



16

stating it's little more than a hyped-up gimmick (notably, our sister title PC Pro declared it "appallingly inaccurate").

Miscellaneous

To end this article, let's take a look at a few control systems and products that don't fit into any of the categories we've looked at so far.

15. Swiftpoint GT – £89

The result of a successful Kickstarter campaign, the Swiftpoint GT is an odd-looking little thing. You grip almost like you would a pen and then move it around like any mouse. The big difference is that by tilting it to the right, you press a switch that activates gesture controls, so you can scroll around with ease, move between pages and so on.

16. Contour RollerMouse Range – Around £200

More than just enormously expensive keyboard wrist rests, the RollerMouse products provide a unique way of operating a PC. As well as the mouse buttons, you get the devices' USP: a rolling cylindrical bar that also tracks horizontal movement along its length, so you can move your cursor in all





0131 337 9298

www.pureitrefurbished.co.uk

48 Hour Replacement Guarantee
14-day Return Policy • 1-3 Year Warranty

QUOTE 'MM10' FOR DISCOUNT



HP Elitebook 8440p
 Intel i5 2.4GHz
 4GB DDR3 RAM
 Webcam
 Windows 7 Pro Installed
 1 Year Warranty
 250GB Hard Drive
 (New SSD from £45 + VAT)

£225 + VAT

Dell Optiplex 755 SFF
 Intel Core 2 Duo 2.33GHz
 2GB DDR2 RAM
 Windows 7 Pro Installed
 1 Year Warranty
 160GB Hard Drive
 (New SSD from £45 + VAT)

£110 + VAT

Dell Optiplex 755 SFF
 Intel i5 3.33GHz
 4GB DDR3 RAM
 Windows 7 Pro Installed
 2 Year Warranty
 250GB Hard Drive
 (New SSD from £45 + VAT)

£240 + VAT

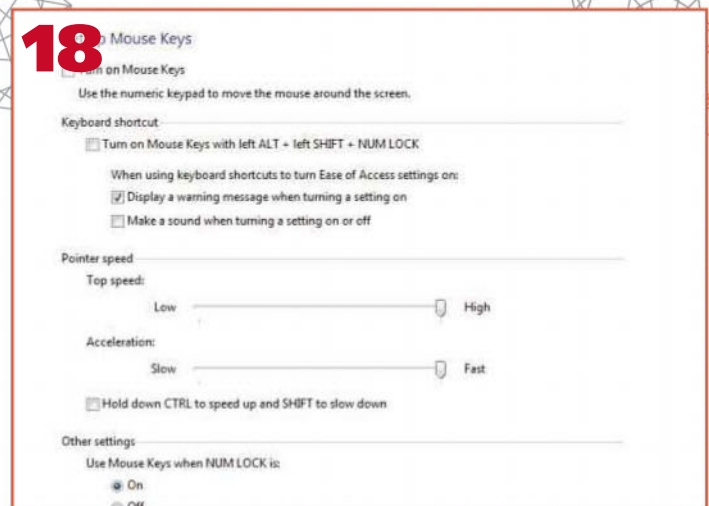
Microsoft
REGISTERED
Refurbisher



17

directions. We tried one out years ago and didn't on with it, but some people swear by them.

17. Xbox Controller
 There are ways to make most modern games console controllers work with a PC, and it's not just for the sake of gaming. With the Xbox 360 controller (and many other controllers), for example, you can use the Xpadder program (\$9.99 from xpadder.com) to emulate mouse movements and clicks. The idea of this is actually to play



18

games with the controller that don't support it, but there's no reason you couldn't also use it for desktop tasks. The main problem is it requires two hands, rather than one.

18. Mouse Keys
 Finally, we come full circle to the idea of using your keyboard to exclusively control your computer. However, we're not talking about learning shortcuts or doing everything using a command line interface. What we're talking about is Mouse Keys, a feature

that's built right into every copy of Windows. If the shortcut for this is activated, you can turn Mouse Keys on by pressing Alt+left Shift+Num Lock. If not, just press the Windows key and search for it.

Once it's turned on, you can move the mouse cursor around using the number pad on your keyboard, with the 5 key working as a left-click. It's an extremely slow, annoying way to control a mouse pointer, but it does work, and it can be a lifesaver when your mouse suddenly dies on you. **mm**

The Return Of The BBC Micro

David Hayward takes a brief glance at the new microcontroller kid on the block

The BBC Micro system formed the foundation of computer studies classes countrywide back in the 80s. It was, on the whole, a good machine and ideally suited for a classroom environment – much to the chagrin of Sir Clive Sinclair, who lost out on kitting out schools with the Spectrum.

Born from the result of the BBC Computer Literacy Project and commissioned by a team at Acorn, the BBC Micro served its purpose admirably. But as with most systems, advancements in technology forced out the expensive Beeb and educational establishments around the country replaced it with the cheaper and more advanced PC.

Now though, 30-odd years later, the BBC is once more dipping its toes into educational computing with the newly announced BBC Micro Bit.

New Beginnings, New Curriculums

In September last year, Britain's schools started the new government's national curriculum to teach pupils as young as five the basics of programming and minor electronics.

The new curriculum is part of an initiative to improve the digital skills of youngsters to help fill a skills gap that will occur within the next five to ten years. The government has therefore decided that digital professionals are the key to the future of this country's needs and economy and as a result systems such as the Raspberry Pi, Arduino and even the humble PC are being brought into prominence.

The BBC's Learning Innovations Division has answered that call with the promise of one million Micro Bits to pupils starting high school, year seven (11 to 12 year olds), for the start of the new term in September 2015.

The BBC is once more dipping its toes into educational computing with the newly announced BBC Micro Bit

As with the original BBC, the Micro Bit is a product of a partnership of technical and educational resources. The list of formal product partners is an impressive read, with the likes of ARM, Element 14, Microsoft and Samsung (see the list in the boxout). Equally, the formal product champions too are just as worthy, with Cisco, Open University and the Python Software Foundation all contributing to its development in one way or another.

What Is It?

The Micro Bit (which, by the way, is the current working project name for the device) is an amazingly small board from what we've so far seen. However, as you would expect from a prototype board, it's not quite ready yet, but it will by September come complete with 25 LEDs, a micro-USB connection, Bluetooth connectivity, an ARM Cortex-M40 processor, accelerometer, digital and analogue I/O and magnetometers.

According to the BBC, it will be compatible with the current Raspberry Pi, Galileo board and Arduino and will on its launch allow pupils to program in Touch Develop, C++ and Python. The I/O won't be quite as versatile as the Raspberry Pi, but it will be capable of displaying text messages through the collection of LEDs, as well as performing the role of a controller to other electronics kits and the like.

Since this is early days at present, so the look and technical aspects of the device may well be altered significantly by the time September rolls around.

As an example, look at the beginnings of the Raspberry Pi. When we first covered the Pi concept all those years ago it was designed as a USB stick. Practicality, though, changed its final design appearance, so the same thing may eventually happen with the Micro Bit.

Getting Creative

Together with the hardware, the BBC is going to great lengths to promote the creative things that can be accomplished with the Micro Bit.

There's an apprenticeship scheme being launched for 5,500 young, unemployed people to help improve their digital skills. And there's also a slew of content being worked on through popular BBC television programmes such as *Doctor Who*, *Horrible Histories* and so on, whereby the user can program around the content or directly control the content through the Micro Bit – moving a Dalek across the screen, for example.

It's a noble concept and one that will no doubt catch the imagination of those



▲ The new Beeb, which is a lot smaller than its predecessor

who will eventually come to use the Micro Bit.

But...

Playing devil's advocate for the moment, the introduction of the Micro Bit has made us consider its overall use. While it's an interesting project, we did wonder why it needs to be there in the first place.

Surely if the country is forecasting a digital skills shortage for the future, then wouldn't it be far simpler to introduce the new curriculum based on current hardware and software? What's wrong with learning how to build a PC or how to control a device through the available I/O ports on an existing PC?

Wouldn't it be better for the BBC to utilise the resources and partnerships at hand to create a series of programmes designed to teach how to program, using Python and the like? And although there will be ample resources available for teachers, wouldn't the money being spent on yet another microcontroller system be better spent on training the current IT and computer teachers and boosting their programming skills and knowledge? It seems like the BBC is reinventing the wheel; there are already countless other microcontroller systems available that can introduce that spark of digital creativity.

Although the BBC has stated that it doesn't see the Micro Bit as a rival to the Raspberry Pi and the other currently available boards, more of a 'springboard', it seems to have become caught up in the mad, blind rush by consumers to own a tiny project board.



▲ Through its programmes, the BBC can teach programming to pupils



▼ The LEDs can be lit up and other items controlled via the I/O ports



▲ The Beeb as we remember it

Finally, to add to the argument, exactly how is teaching pupils to interact with a niche piece of electronics going to fulfil this digital professional gap in the economy? Yes, it's interesting at the time, making the little light blink on and off by using a customised string of code, but when the student matures and goes into the 'real world', whether that's college,

university or work, everything they've learned so far will be completely irrelevant when they come to use Unity, Unreal Engine, Flash and countless other graphical environments. Also, will using these custom programming strings allow them to debug pages of code, as would happen in the workplace?

It's the foundation of using digital tools here, but is it actually teaching the pupils anything worthwhile?

Conclusion

Despite our mini-rant a moment ago, we do think that every opportunity for youngsters to get their hands dirty with basic computing and electronics is a good thing.

In this world of soulless tablets and phones, we miss those times when we actually had to take something apart to improve it, upgrade it or just to get it working. And we often recall with great fondness the joy and triumph of tapping out pages of BASIC and making a series of characters race across the screen.

So while the BBC Micro Bit may appear as yet another mini microcontroller board, we can't refuse the pupils of today that same feeling that we had all those years ago. And who knows, maybe it will result in the UK once more becoming a digital powerhouse of the global community. **mm**

Partners

As per the BBC Media Centre press pack, here are the partners who will be taking part in the manufacture, distribution and educational resources for the BBC Micro Bit.

Formal product partners who are taking the lead on design manufacture and distribution include:

- ARM
- Barclays
- element14
- Freescale Semiconductor
- Lancaster University
- Microsoft
- Nordic Semiconductor
- Samsung
- ScienceScope
- Technology Will Save Us

Formal product champions involved in outreach and educational resources include:

- Bright Future
- CISCO
- Code Club
- CoderDojo
- Code Kingdoms
- Creative Digital Solutions
- CultureTECH
- Institution of Engineering and Technology
- Kitronik
- Decoded
- London Connected Learning Centre
- Open University
- Python Software Foundation
- STEMNET
- TeenTech
- Tinder Foundation



Component Watch

Got a bit of cash spare for a wireless speaker? James Hunt has some ideas for you

When you're looking for Bluetooth speakers, it's easy to concentrate on the affordable end of the market – small, portable devices that you can chuck in a bag and not worry about. But what about the alternative options? What if you want a high-end, powerful speaker system that just happens to be wireless as well? If you don't mind spending a little bit extra in return for high-quality sound output and wireless connectivity, this week's Component Watch is for you, as we look at the best stand-alone Bluetooth speakers with an RRP over £100.

Deal 1: TDK A360
RRP: £134.99 / Deal Price: £96.37

Slightly retro styling gives the TDK A360 a distinctive look, but the sound it produces is thoroughly modern. Certified to IPX3 for protection against water, it's ideal for outdoor use, and the built-in carrying handle practically encourages it. An integrated USB port allows you to use it as a charge point, and Bluetooth connectivity keeps it connected to your device wherever you take it.

Where to get it: Kikatek – bit.ly/1BvbDhr



Deal 2: Sony SRS-X3
RRP: £129.99 / Deal Price: £99.99

Sony describes this speaker as providing "elegant, portable sound", but all we know is that with 20W output, dual passive bass radiators and NFC connectivity, it's a device that can't help but impress. A seven-hour battery life and portable design allow you to take your music anywhere, while connectivity with the Sony Entertainment Network allows you to stream content out of the box. It even comes with a built-in microphone to allow hands-free calling. Available in various colours, but as ever, black seems to be the cheapest!

Where to get it: John Lewis – bit.ly/1Eo8imd



Deal 3: Creative Airwave HD
RRP: £149.99 / Deal Price: £105.95

An upgrade of the earlier Creative Airwave model, the Creative Airwave HD features Bluetooth pairing and one-touch NFC, allowing you to establish connections in seconds from any compatible device. A compact form factor and rechargeable battery allow you to take your speaker with you, and Creative Multipoint means you can connect two devices at the same time, so there's no need to reconnect if you use more than one device!

Deal 4: Pioneer XW-BTS5-K
RRP: £199.99 / Deal Price: £121.18

If you want a pair of wireless speakers that sound and look high end, you can't go wrong with the Pioneer XW-BTS5-K, a pair of 25W speakers with exterior wood panelling that help them blend into the background in any room. Huge bass and separate tweeters give great sound, while one-touch Bluetooth pairing ensures a simple setup. They aren't cheap, but with this deal you can get a fair amount off.

Where to get it: Amazon – amzn.to/1O3zBdv



Deal 5: Soundfreaq SFQ-06i
RRP: £199.99 / Deal Price: £149.99

The Soundfreaq SFQ-06i is a Bluetooth compatible room speaker featuring a universal device mount for phones and MP3 players with USB-cable management or a standard line-in port for devices too large to go on top. A remote control app is available on some platforms, so you can control the output from your phone or tablet. You can even buy two and use the proprietary Dual Streaming System to set them up in stereo! Absolutely tons of features worth going for.

Where to get it: Argos – bit.ly/1MKQfva



ON SALE NOW



Order your print or digital MagBook
at magbooks.com



BBC Hands Out Computers To Schoolkids

Guess who's back?

Slowest Broadband Street In Kent

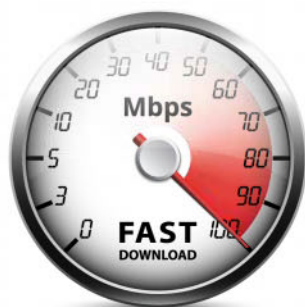
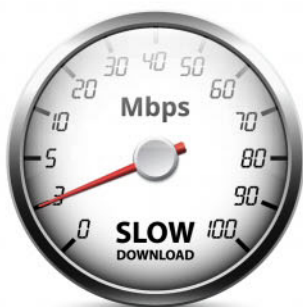
UK's digital divide is huge

Kent is a lovely place, by all accounts. If you live in Williamson Road, Romney Marsh, however, it is certainly not a place to enjoy fast broadband. That road holds the dubious accolade of offering the broadband speeds in the UK with an appalling average of just 0.54Mbps.

Residents of Sandy Lane in Cannock, Staffordshire will be choking into their breakfast cereals at those speeds as their own average speed is a lovely 72.86Mbps on average. This all adds up to the crazy statistic that

people living at Sandy Lane enjoy broadband speeds that are 135 times faster than those residing at Williamson Road.

Beyond those two particular streets, this slice of research courtesy of uSwitch reveals that a third of the UK struggles with speeds under 5Mbps and the North of England offers twice as many fast streets than those in the South, according to a list of the top 30 speedy streets. Also, surprise, surprise, how good your broadband is very much a postcode lottery. Something to consider if you're looking to move house.



Freak Fix Released

Browser bug finally dealt with

Both Microsoft and Apple have released fixes for the Freak web browser bug. It took the firms around a week to get the patches out there, and users everywhere should updating – as this was quite a serious security flaw.

Found by security experts, Freak allowed hackers to potentially attack systems using encryption technology, which is obviously a major security threat and even though it took them a little longer than people may have liked to sort this out, we're pleased that the big boys have finally got their act together.



Anyone of a certain age will remember when the BBC Micro was ubiquitous in schools. The Acorn Computers system was intended to give children a grounding in coding, and those who remember using them do so with a certain fondness.

Now, the Beeb has announced that it's giving away "personal coding devices" to Year Seven pupils right across

the country as part of its Make It Digital initiative. The Micro Bits project is looking to build on the success of the mighty Micro by giving a million units away – meaning all Year 7 pupils will receive one from the coming autumn term.

In conjunction with this giveaway, the BBC is launching a season of coding-based programmes and activities, including a documentary on Bletchley Park and a drama based

on *Grand Theft Auto*. The entry-level Micro Bits PC, which is still in development, is going to be a small, wearable device with an LED display that kids can connect to a computer and get coding right away. ARM, Samsung and Microsoft are among the partners on this and this sounds like another promising BBC initiative.

Read more for yourself via the BBC website – the image of the possible prototype is also on there.



Destiny Wins At BAFTAs

Bungie's big budget behemoth bags best game gong

Now this was a bit of a surprise: *Destiny*, the much-maligned 'most expensive video game ever developed' has been named as the Best Game at this year's British Academy Game Awards.

Bungie's shooter famously received so-so reviews from critics when it was released last year, despite an awful lot of hype, yet it still managed to bag the top prize. It could be said that this was unexpected given that critical reviews of the game were hardly singing about it from the rooftops.

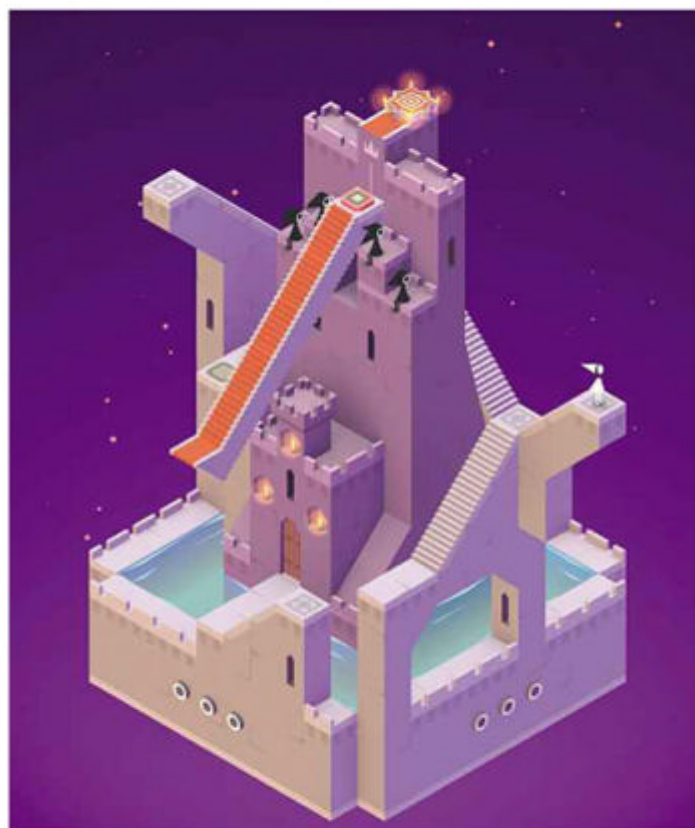
Away from *Destiny*, a well done should also go to actress Ashley Johnson for winning another award for her voice work on *The Last of Us* – or, more specifically for the spin-off chapter *Left Behind*.

The Best British Game award was handed to *Monument Valley*, a game recently seen on Netflix's *House of Cards* TV show. By all accounts, its airing on that show has seen an almighty sales bump, and its award wins here (it also bagged the Mobile and Handheld category title) was

on top of its iPad Game of the Year win in December.

Sussex-based team The Creative Assembly also won an audio achievement award for *Alien: Isolation*, so well done to

them. However, it will probably always be that unexpected *Destiny* win that people will remember from this year's awards ceremony. Do you think it deserved its award?



Recently, I took the optical drive out of my laptop and replaced it with an SSD, because despite being only about three years old, it was getting a bit sluggish. The difference, as I expected, was huge.

Yet in spite of knowing it was going to boot faster and open programs more quickly, I was still taken aback.

Solid-state storage has been with us for quite a few years now, but it still seems exciting and new, and it can really transform an old system into something much more impressive.

And with prices of SSDs now looking more than reasonable, there's never been a better time to get on board with this technology. Just make sure your motherboard can accept one of these drives, and then simply make the swap.

If you haven't tried one before, you're in for a surprise. And even if you have, then like me, you still might find yourself being wowed all over again.

See you next time...

Anthony

Editor

Meanwhile... On The Internet...

To computer enthusiasts of a certain age, the name Jeff Minter (tinyurl.com/Motl1355b)— affectionately known as Yak by many – is a name held in very high esteem. Having started his coding career creating games for the ZX81, he founded Llamasoft (tinyurl.com/Motl1355c) in the early 80s and gained notoriety on the 8-bit scene for his takes on the prevailing genres of the time. Among Llamasoft's classic titles were *Gridrunner*, *Hover Bower* and the *Mutant Camels* series of games – but aside from that he also produced games for Atari, chief among them *Tempest 2000*, an update of the firm's *Tempest* title from 1981, before going on to produce a range of other titles on various other formats after the demise of the company. One of his more recent projects was a further twist on the *Tempest* concept, called *TxK*, which was released on the PS Vita last year, and it's this that has seen him embroiled in legal wranglings with the company now trading as Atari (tinyurl.com/Motl1355d), an argument that blew up on social media last week.

It would seem that the latest incarnation of Atari – or “Atari” (note quote marks), as Minter suggests we now refer to it (tinyurl.com/Motl1355e) – was not impressed with Minter's plans to port *TxK* in the near future and thus sought to block all attempts due to the similarities between *TxK* and *Tempest*. The matters appear to have come to a head last week after a good bit of paper-based to-and-fro between Minter and Atari's legal team (Minter claims to have never actually spoken to anyone from Atari itself, despite claims to the contrary from the firm: tinyurl.com/Motl1355f), when Minter was accused in documents of stealing directly from Atari's source code for *Tempest 2000* (which he, of course, wrote) and trying to trade on Atari's name and reputation.

Most people will probably have become aware of the matter via a series of increasingly angry tweets from Minter's [llamasoft_ox](https://twitter.com/llamasoft_ox) Twitter account, after he outlined the reasons for his ire in a post on the Llamasoft YakYak forum (tinyurl.com/Motl1355g). His timeline for proceedings outlines attempts to negotiate a branding agreement for the intended ports of *TxK* (all of which he claims were rebuffed) and how he had previously been excluded from receiving royalties on a game called *Tempest X* by none other than Atari itself.

It's an interesting legal situation, and like the *Blurred Lines* case, which has been generating so many column inches, it calls into question the point where influence becomes outright appropriation; however, the waters here are somewhat more

It was a widely pointed out truism that even though the Silk Road had been bought down twice, the marketplaces for drugs and other less-than-over-the-counter goods and services on the dark web were continually growing (tinyurl.com/Motl1355m). However, in a strange twist to the post-Silk Road tale of illegal online trading, the largest Tor-based site for such activities, Evolution, suddenly disappeared last week (tinyurl.com/Motl1355n), apparently apropos of nothing.

However, contrary to the case of Silk Roads 1 and 2, the disappearance of Evolution – which arose as the apparent successor to Silk Road in their absence (tinyurl.com/Motl1355o) does not appear to be a feather in the cap of law enforcement. Rather, it would appear that customers of Evolution were the victims of a so-called 'Exit Scam' by the site's administrators, who seem to have taken off with something like \$12 million worth of Bitcoin (tinyurl.com/Motl1355p).

According to accounts from users posted on Reddit, problems started to manifest themselves in the form of delays in withdrawal of Bitcoin's from user accounts, which were initially explained away by the site's admins – who went by the name of 'Kimble' and 'Verto' – as procedural matters. However, before the deadline the pair had set themselves for resolving these 'issues', the site and its forum disappeared altogether.

The rip-off, while possibly damaging to the value of Bitcoin in the short term, will probably be written off as an occupational hazard by vendors and an annoying inevitability by customers. It's also highly likely that another market will emerge to take up their business.

muddled by Minter's integral role to both versions of the game. What's for sure is that the force of internet opinion appears to be behind the Llamasoft man, and not many seem to be backing “Atari” (tinyurl.com/Motl1355h)

In a not-unrelated matter of philosophy – and certainly as a matter of interest in the run up to the UK general election – while The Pirate Party may be a strictly niche party on these shores, it's not the case everywhere (tinyurl.com/Motl1355i). Indeed, in Iceland a recent poll has registered support for the anti-copyright politicians at 23.9% (tinyurl.com/Motl1355j).

It's a state of affairs, *Ars Technica* notes, that – should it be translated to votes when the country goes to the poles in 2017 – could lead to the country offering citizenship to Edward Snowden (a move that it first proposed in the country's parliament in 2013).

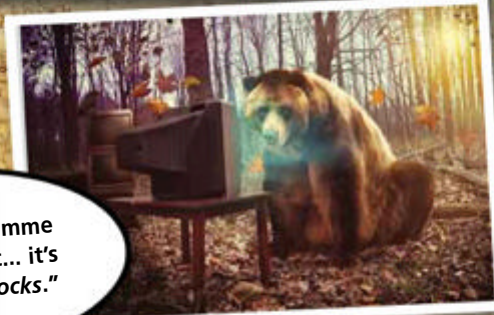
As if to prove that the internet is a frightening meritocracy where the normal rules of sanity simply do not apply, we offer up this article that charts the rise of the Little Baby Bum YouTube channel (tinyurl.com/Motl1355k), which is now the fifth most popular channel on the site, despite being run by a husband and wife team from the UK who were formerly employed in IT and design.

.AVWhy? Videos For Your Eyes... Not Necessarily For Your Brain

The shenanigans you can see online can often leave you wondering if we're truly entering the last days of a decaying civilisation – and this week's video choice is just another example of this can't-watch-can't-not-watch phenomenon. It's the work of YouTuber RomanAtwood and depicts a prank played on a his friend involving a lavish California home and a truckload of toilet paper (tinyurl.com/Motl1355l). Frankly, if he does this to his friends, I really wouldn't want to be his enemy.



Caption Competition



"It's a programme about a heist... it's called *Goldilocks*."

Our Ursine friend here was the subject of the caption competition in MM1353. You did your bit, as always...

- **JayCeeDee:** "I'm a bear... I'm in the woods... What do you think I'm doing?!?"
- **pesukarhu:** "Survival With Bear Grylls."
- **Phil Pumphrey:** "This programme is bearly watchable."
- **Doctoryorkie:** "Yes, I do SIT in the woods."
- **Thomas Turnbull:** "You see, we do other things in the woods as well."
- **Bullstuff:** "Why do we have to hibernate every winter? That's when all the best programmes are on!"
- **Jimbillroo Digital:** "Gogglebox Gone Wild"
- **Ritasueandbobtoo:** "I don't bearleave it, No *Top Gear*."
- **pesukarhu:** "I've heard of a Honeypot PC, but Honeypot TV's... REALLY?!?"
- **Pete Heaven:** "No wonder they spend so much time in the loo."
- **Thomas Turnbull:** "It's one of the bear necessities of life."
- **Brian Jones:** Oh no not David Attenborough again, I can't bear it..."

Thanks, all, and congratulations to our winner, JayCeeDee, with "It's a programme about a heist... it's called *Goldilocks*."

To enter this week, head to the 'Other Stuff' section of our forum (forum.micromart.co.uk) and say something funny (but not too rude) about the picture below or email us via caption@micromart.co.uk.



Alibaba Spends \$200m On Snapchat Stake

Now it's one of world's most-valuable start-ups

Snapchat is just four years old, but it's now valued at around £10bn. The mind truly boggles. Indeed, Chinese e-commerce company Alibaba's has reportedly taken the decision to invest \$200m to grab hold of a stake in the

messaging firm, according to a bunch of media reports. With Snapchat's users apparently sending 700 million text and picture messages every day, the service has become a big deal and it's clearly been on Alibaba's radar, judging by the level of stake involved.



Cortana May Be Offered On iOS And Android

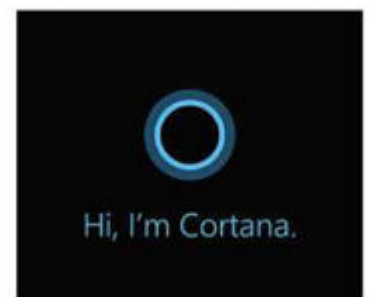
Microsoft bringing assistant to rival platforms?

In what would seem a pretty strange move for Microsoft, news agency Reuters has reported that the company will roll out the Cortana digital assistant as a standalone app for Android and iOS devices. The agency cites "people familiar with the project" as the source for its news.

The service itself is undergoing a revamp with an AI project's research being used to help give it a leg-up in its functionality, which is all good news for potential users. The fact that this will be introduced for iOS and Android, however, is a little

strange considering they already have Siri and Google Now respectively.

Presumably, Microsoft sees some form of revenue potential in such a venture, but it's hard to see any real benefit to the company giving away its service like this.



Snippets!

Nat Bans Selfie Sticks

London's National Gallery has banned selfie sticks in a move to "protect paintings, individual privacy, and the overall visitor experience", it says. It's not the only gallery to take this stance, either, as others around the world have adopted the same policy. It's a fair enough approach to what has, bafflingly, become a bit of a phenomenon.

They are, let's face it, highly annoying and all a bit silly to boot. Despite there being people seriously interested in buying big sticks, can we just add our own voice to calls for them to be banned? If no other reason than you look a bit of an idiot with one of these in tow.

Intel Blames PC Sales

Intel recently revises its revenue outlook for Q1 of 2015 to the tune of \$1bn, with far weaker-than-expected business desktop PC demand blamed for the updated projections. In a statement, the company wrote "The company believes the changes to demand and inventory patterns are caused by lower than expected Windows XP refresh in small and medium business and increasingly challenging macroeconomic and currency conditions."

Big Three Can't Satisfy

BT, Sky, or TalkTalk customers are likely to be far less happy with their service than customers of smaller providers such as Zen or John Lewis Broadband according to a *Which?* Report on satisfaction. Customer scores for the largest providers in the UK were below 50%, while the likes of Zen Internet scored above 70%. *Which?*'s executive director said that smaller providers were leaving larger rivals "in their wake" in terms of services, and advertised speeds remain a serious problem. Indeed, *Which?* is campaigning against rules that enable broadband providers to advertise speeds that just 10% of customers get.

US Woman Issues Bomb Threat Over Service Problems

Cable company makes her really, really angry

You can often rely on America for a good story, and here we bring you news of a woman in Nebraska who phoned through a bomb threat to the customer service desk at Time Warner Cable –

all because one of its cable guys didn't show.

No bomb was actually found and much police time was wasted, leading the woman involved to be arrested for her ill-advised rant. By all accounts, the woman was

particularly cross because a planned callout to fix her broadband was cancelled and she was off work at the time to allow the fix to take place. She must have really, really needed that broadband... Now, she needs a lawyer, too.

Yahoo Rolls Out On-Demand Passwords

Forgot your password? No worries with Yahoo

Yahoo is looking to revolutionise the password business with its US rollout of on-demand passwords, texted directly to the user's mobile phone.

Announced at the South by Southwest festival, the system will work by sending a text to a user's phone with a password,

rather than the user having to remember even more access details alongside the many that we're asked to store in our brains these days.

So, once this feature is enabled, every time you login you'll be texted an on-the-fly four-character password rather than using the same password based on your first kiss/favourite

chocolate bar/worst memory... And so on.

This is a significant move from Yahoo, and could alter the way that websites handle such things should it be picked up widely. We really rather like the idea, truth be told. Anything that means we have to cram one less bit of data in our memory is a good thing with us.

YAHOO!

Facebook Bans Your Buttocks

Guidelines tell what can and can't be published

The press had a field day last week examining details of Facebook's expanded and clarified community standards in minute detail, after they were published in an online article from the company – see it for yourself at www.facebook.com/communitystandards.

Several reports chose to focus on the fact that the social media site doesn't look too kindly on "fully exposed" buttocks, unless they are present in a photograph of a painting or sculpture. Meanwhile, and on the more serious end of the censorship spectrum, the statement also covered the thorny issues of hate speech, images of graphic violence – which is now right out of the question if said imagery is intended for any purpose other than highlighting human rights concerns. Similarly, Facebook won't allow any expression of support for crime, but if you'd like



to sell guns then that all depends on whether or not you're respectful of any applicable gun laws as they stand.

Cue outraged media headlines stating that exposed buttocks are banned. Sigh.

SoftMaker Office Picks Thunderbird

Suite ditches eM Client for Thunderbird

The alternative office suite SoftMaker Office is about to enter into its 2016 iteration, as public beta testing is just around the corner.

Alongside promising to be even faster than previous versions, more user-friendly, and include a bunch of feature improvements, Office 2016 is also replacing its eM Client email program with a SoftMaker-enhanced version of Thunderbird and the Lightning calendar software. Why the switch? In SoftMaker's own words, Thunderbird is "one of the most powerful email programs

around" and the firm has put together a number of extensions to adapt the UI to the look and feel of its suite. For previous

users, there will also be an import filter for eM Client databases for full migration of emails, address books, calendars and tasks.

If you want to give SoftMaker Office a try, head over to www.softmaker.com to get a better look.



SoftMaker
Office

MSI Adora20 AIO PC

Light and stylish, that's how we like our all-in-one PCs

DETAILS

- Price: ~£260
- Manufacturer: MSI
- Website: goo.gl/GmqOUZ
- Required Spec: Internet connection, Bluetooth dongle for Bluetooth connectivity

Most all-in-one PCs tend to be high priced, over large and unwieldy setups. Yes, they perform reasonably well, and they do offer the appeal of taking up less overall space than a traditional desktop PC and monitor, but they often sacrifice that appeal in favour of looks or functionality. However, towards the end of last year MSI released the Adora20, which lays the foundations for its newer generation of stylish, functional and lightweight all-in-one PCs.

At a first glance, the Adora20 could easily be mistaken for an Apple product. The clinically white colour scheme with a band of brushed aluminium at the bottom, neat rounded edges and matching style wireless (USB dongle included) keyboard and mouse, all speak of a system that wouldn't look too out of place in some trendy office in the heart of the city. There's a lot going on under the aesthetically pleasing surface, though.

The Adora20 comes with a quad-core 2GHz Intel Celeron J1900 processor, 4GB of DDR3 SO-DIMM memory and a Hitachi Travelstar 500GB hard drive with Windows 8.1 Bing Edition pre-installed. The screen is a decent enough 19.5" panel displaying an resolution of 1600 x 900. It feature anti-glare and anti-flicker

technology together with the ability to emit less blue light. The end result is easy on the eyes and ideal for longer stretches in front of the computer.

It's an incredibly slim and lightweight all-in-one PC is the Adora20, measuring just 491 x 34.7 x 375mm, with a minimum thickness of 23mm and weighing only 6.43Kg. Somehow, MSI has managed to squeeze in a three-in-one card reader, DVD, 802.11 b/g/n wi-fi, five USB 2.0 and a single USB 3.0 port, HDMI out, gigabit Ethernet, a 1MP webcam and a pair of 3W speakers, all into a single unit without feeling like the connectivity is cramped or too close together. You can even wall mount it thanks to the VESA screw holes.

A kickstand mounted on the rear of the screen provides a sturdy enough base for the unit to sit on. The stand can be pulled out until it's perpendicular with the back

of the unit, bringing it into a more relaxed position that's ideal for touchscreen readiness – alas, this unit didn't come with touchscreen capabilities, however a 10-point touch is available on specific models.

Although the system specifications are reasonably good, don't expect this AIO to become a gaming machine on its day off - the *Sniper Elite v2* benchmark we ran on the Adora20 only managed 5.1 FPS, which is pretty awful. For standard office duties though, such as browsing, watching HD content, Skype and conference calling, this is an ideal machine. It's quiet, stylish, takes up very little room and contains everything an office workstation should – and it does it with a lot more elegance than the usual under the desk tower affair.

The MSI Adora20 isn't a bad, basic and entry level all-in-one PC. The combination of looks, design, low power consumption, very little weight

and slimline aspect are certainly enticing for the consumer. Moreover it's price makes it a more acceptable AIO than the far more capable products on offer from the competition.

At roughly £260, the Adora20 is certainly worth considering, providing you accept the fact that this isn't the world's most powerful PC but rather one that keeps everything contained within a single, neat and stylish package. **mm David Hayward**

A good looking, thin, lightweight and functional AIO PC



Brother MFC1910W

Michael Fereday foregoes colour to check out a mono laser device

DETAILS

- Price: £155
- Manufacturer: Brother
- Website: www.brother.co.uk
- Required Spec: Windows XP Home and later or Mac OS X 10.7.5 and later.



The MFC1910W is a multifunction mono laser product from Brother, bringing together print, scan, copy and fax functionality with a built-in ADF (Automatic Document Feeder) module. The “W” part of the product’s model number gives the clue that this device possesses wi-fi capabilities as well as USB connectivity.

The base contains monochrome laser printer, while an A4 flatbed scanner – with built-in ADF module – sits on the top of this device. Positioned between these two elements is a control panel arranged along a protruding lip.

This panel features two-line LCD providing feedback information regarding status and current activity. However, due to its fixed positioning, it is not the easiest task to read the content. I found this was only possible when looking straight down on the screen. Arranged on either side of the screen are various buttons plus an alphanumeric pad for use with the fax facility.

The main paper input is from an open style tray positioned at the base of the unit. The tray has a capacity of 150 sheets of A4 paper, which is fed through a U-bend path to appear as printed documents in an opening just below the control panel. There is a support flap to help ensure

printed documents are kept under control as they emerge, but you will need to raise the top of the device in order to bring this flap into play.

An instruction sheet, CD and User Guide help to lead you through the product’s set-up procedure. After inserting the toner cartridge into the belly of the printer and selecting your choice of country/ language, you can install the various drivers and MFL-Pro Suite software, and decided whether you want to opt for a USB or wi-fi connection. When selecting the latter, you have the choice of making the initial connection via a temporary USB link or using WPS to automatically establish the wireless connection.

The Brother print driver gives you a choice of 300dpi, 600dpi or HQ1200dpi print qualities with further options to select text or graphics content. Testing the three print qualities with a single-page document, I struggled

to identify any differences between the resulting printed outputs. There was a slight difference in print speed with 300dpi quality producing 21ppm and the other two only managing 20ppm. Switching to image printing produced similar results.

The A4 flatbed scanner has a resolution of 600 x 1200 optical or 19200 x 19200 interpolated with 24-bit colour or 8-bit greyscale. When scanning to a computer there is a choice of TWAIN or WIA interface. Working in conjunction with the printer to produce photocopies, a single A4 page took 17 seconds while an eight-page document delivered from the ADF was produced in 121 seconds.

Up to 99 speed dial numbers can be set up for the fax facility. This feature can send individual messages or broadcasted to speed dial numbers and up to 20 manually entered numbers. Incoming messages can be

saved in memory for later transfer to a computer.

Although the Details box out at the start of this review quotes the Brother RRP price for the MFC1910W, Amazon is currently listing this product at £120. A replacement toner cartridge, rated at producing 1000 A4 pages, is listed at £34. **mm Michael Fereday**

A reasonable mono multifunction laser device especially at the Amazon price



Western Digital My Cloud EX2100

Mark looks at Western Digital new Expert Series NAS box and likes what he sees

DETAILS

- Price: £239 for the diskless unit, £399 for 4 TB, £539 for 8 TB, £709 for 12 TB
- Manufacturer: Western Digital
- Website: wdc.com
- Required Spec: Wired network infrastructure

No longer wholly satisfied with just making NAS-optimised hard drives, Western Digital has also been developing its own NAS boxes. Last year it produced a range of equipment that included the single sealed unit devices like the My Cloud Personal Cloud Storage, and the more flexible EX2 and EX4 multi-drive boxes. Now it's come back to expand the 'Expert Series' range further with four new boxes, covering home and small business users who want a fire-and-forget small server technology.

The new My Cloud EX2100 is the bottom rung, but still a step up from the previous dual drive My Cloud EX2 that I raved about in this very magazine nine months ago. Externally this hardware has thrown off the Digital Book ethos, and instead it looks exactly as you might imagine a dual drive NAS box would appear. On the front are two easily accessible drive bays for 3.5" mechanisms, a power switch and a USB 3.0 port. Around the back is another high performance USB port, dual gigabit LAN ports (for aggregation), and a socket for the small external power block.

It's powered by an ARM based Marvell Armada 385, has 1GB of RAM and (depending how you

purchase it) can come either as drive-less or with 2x 2TB (4TB), 2x 4TB (8TB) or 2x 6TB (12TB). The 8TB review model came preinstalled with the My Cloud OS, two WD Red 4TB drives configured in mirror mode, and was ready for deployment right out of the box.

The My Cloud OS is deceptively simple, but has most of the critical features that most NAS box owners are looking for. That includes DLNA, Mac Time Machine, FTP access, active directory, iTunes server and a P2P client.

It supports users and groups, and you can even allow them to access the shared files remotely. One curiosity is that the initial user is 'Admin' and, while you can rename this user, it is only one empowered with admin rights. You can't bless other

“ I'd never categorise it as cheap, but that doesn't stop it being great value for money ”

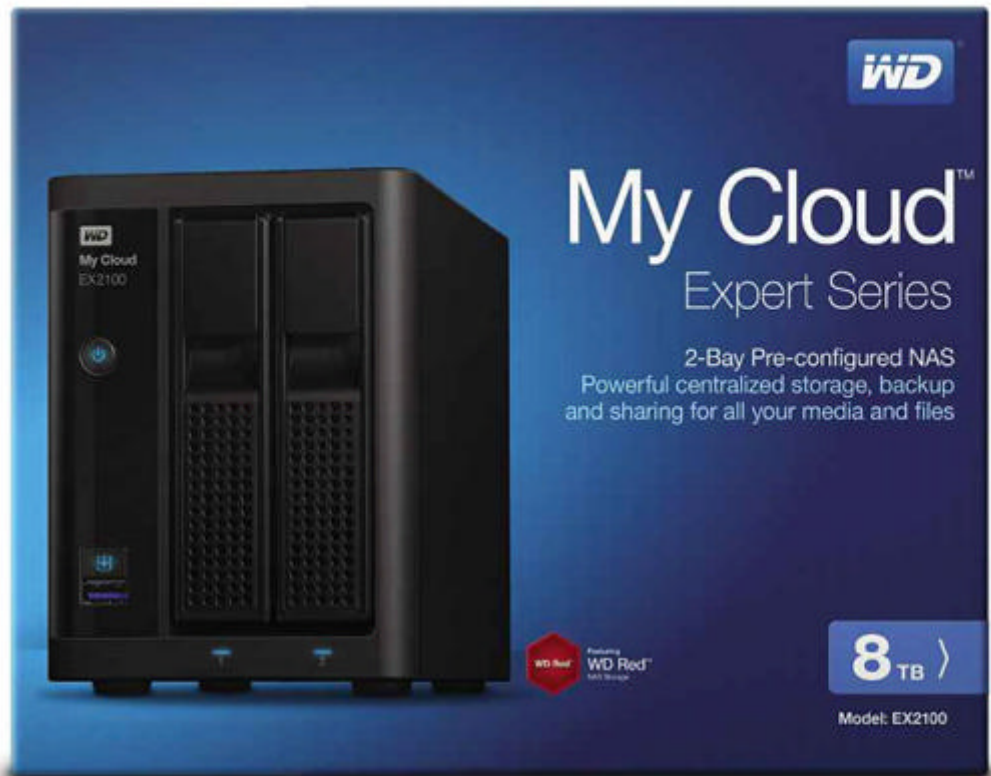
users with these powers or the enhanced interface that the admin user gets.

Extensions to the core facilities come in the form of apps, of which there are relatively few at this time, but more are promised. They currently include Joomla, IceCast, aMule, phpBB, phpMyAdmin, SqueezeCenter, WordPress, Transmission and Dropbox – which is also inherently supported as a backup target.

That's not many compared to what some other platforms

can claim, but it is a start and Western Digital's software team is apparently working hard to expand the selection. Indeed, it's already done some sterling work in respect of the 'Volume virtualisation', as the EX2100 supports the splicing of multiple iSCSI sources to create a seamless expansion path.

That means that if you fill up your EX2100 and want to add another or an EX4100, the My Cloud OS allows you organise shares using an iSCSI virtual volume, binding the new hardware in to support



subfolders without the connected users even being aware of the changes to the hardware they're accessing. Those in small business IT support will love this feature.

When I covered the EX2 I remarked on its impressive turn of speed, but compared to the EX2100 it looks positively pedestrian. All the testing I did was with the drives in Mirror mode, which isn't generally the best way to optimise performance. However, it still managed reading and writing at 115MB/s over a single Gigabit Ethernet line. Using dual line aggregation it is probably faster or rather it would be if you added up the performance experienced by multiple simultaneous users. That's really good news for the EX2100 when the apps become more prolific, because there is probably enough power in here to drive these services without negatively impacting on file serving performance.

Compared with some other dual drive NAS boxes, the EX2100 might seem a little on the expensive side, especially once you've populated it. The performance levels for a dual drive box are exceptional, and the My Cloud OS is both easy to follow and configure. There is only one critical element

missing in this technological vista, a personal cloud application. At the launch of new hardware I talked with senior Western Digital people and was reassured that a killer 'sync' application was in the pipeline that would deliver the sort of experience that those

who use Synology equipment have come to rely.

Once that critical piece of the jigsaw is in place, the EX2100 can become what we all want; a true Cloud Service that isn't reliant on the grace of Google, Microsoft or Dropbox. If Western Digital can deliver

this as promised, the EX2100 will transform from being a top-notch miniature file server to something even more desirable. With the EX2100, how seriously I take Western Digital's NAS box ambitions has been significantly elevated.

mm Mark Pickavance



A fantastically fast and elegant dual drive NAS



Savage Lands

It's all about survival of the fittest or at least the one wielding the iron club

DETAILS

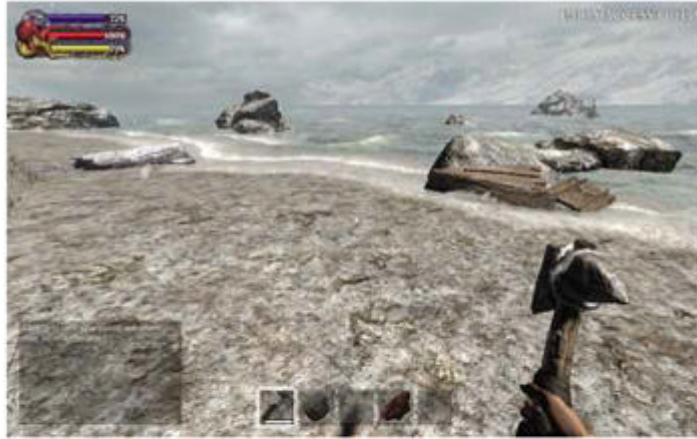
- Price: £19
- Manufacturer: DigitalDNA Games
- Website: goo.gl/TVCEXD
- Required Spec: Windows 7+, 2GHz dual core CPU+, 4GB RAM, GTX460/HD6870+

The recent success of a number of games whereby the character is left in an open world to fend for themselves has quite an effect on the gaming community. The likes of *Rust*, *Day Z*, *H1Z1* and so on are games that place the player in a first person environment and see just how they last in such a world. It's an interesting concept and one we quite like.

Savage Lands, from developer DigitalDNA Games, is one of the newer entries into the survival fantasy world. You, as the main character have found yourself marooned on the shores of a strange land, where there is a menagerie of beasts and a collection of Harryhausen-esque animated skeletons.

You start on a beach, with nothing but a few tattered shreds of cloth to preserve you decency and keep you warm. From there you are given a checklist of micro-quests, found in your journal: gather stones, wood, find a primitive weapon, kill deer, make a campsite and so on.

After a while, you get the gist of the various keybindings and where to find the essential components to craft the items you'll need to both tick off the check list and, ultimately, survive. As you would expect from such a game, crafting is the only way you're going to get anywhere. After killing off your first few deer, you'll be able to use sinew, deer hide and wood to fashion



some better armour and clothing, and eventually you'll be able to use bone and wood to make a better weapon than the crude hammer you'll eventually find lying around on the beach.

It's a familiar setup, but we did like the way the developers have handled the crafting of a structure. In this instance, you can have the core materials and place the structure – such as a lean-to, for example – and add to it as you

gather more logs, sinew, hide or whatever else it is you need. And the structure will remain in a semi-built state indicating the missing components until it's finally built. It's a small element of gameplay, but one that means you're not constantly having to forage, drop, forage, drop, for the best part of an hour or so.

The game itself is still in the alpha stages, so an Early Access Game on Steam there

are naturally one or two issues you'll no doubt come across. We did have a few glitches where we became stuck between outcropping rocks or the deer we were hunting became a part of a tree.

Graphically, think of *Savage Lands* as a kind of cross between *H1Z1* and *Skyrim*. It certainly looks good, despite the occasional glitch, and your character moves semi-realistically throughout the environment.

Added to all this is fact that you can host or join a server based game and invite your friends into the world with a password enabled game. Alternatively, you can go it alone in a solo instance or join one of the many globally hosted servers. Either way, there's plenty to get your teeth into.

This is not a bad game to get in early with, to see how long you can survive for before you get picked off by a bear, wolf, skeleton or some other nameless horror and to see how far into the game to manage to progress. It's a gamble, to a degree, as there's no guarantee that the game will ever be finished or succeed alongside other titles of this genre. That means, at £19, we think it's a bit of an expensive gamble.

mm David Hayward

A tad expensive for something that's so far from being finished



System Mechanic 14.5

Kevin Pocock greets an old pal, still fighting the good fight

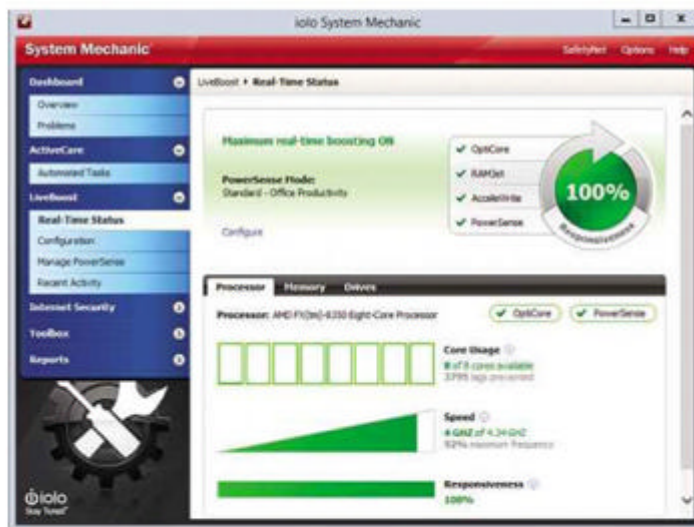
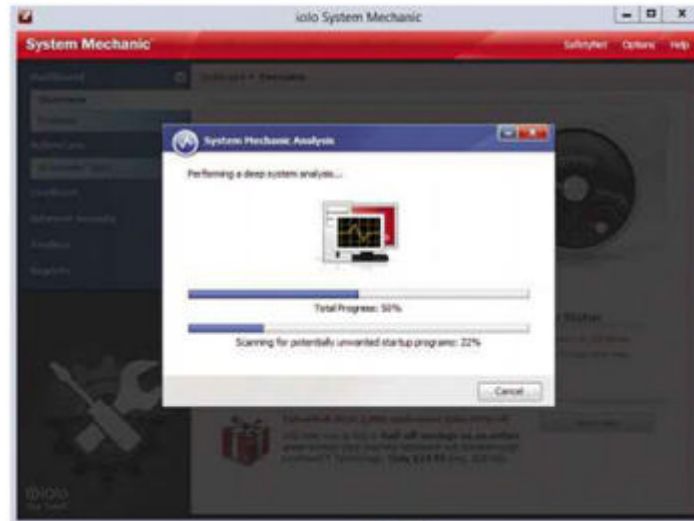
DETAILS

- Price: \$40 (c.£27) for a Whole Home License
- Developer: Iolo
- Website: www.iolo.com
- Specs: Win Vista/7/8/60Mb hdd, 256MB RAM, Internet connection

Anyone who's worked with a variety of Windows versions will likely have come to know of tweaks and tips to keep their systems in fine condition for longer. For those with less drive to get into the nuts and bolts of their OS, for the last 16 or so years Iolo's answer to lifting this particular burden (and doing more besides) has been System Mechanic.

Although there's a *Micro Mart* shed-load of tune-up programs on the market, System Mechanic has always combined those advanced tweaks with a clutch of tools in an easy-to-use and comprehensive package – and version 14.5 of the software (as the name suggests) is a refinement, rather than a complete overhaul, of this paradigm. Users of recent versions of the software will know where to find the individual tools and one-click solutions on offer. Meanwhile, new users will feel any wariness quickly give way to a sense of calm – particularly since they are helpfully nudged to get cracking right from the dashboard.

Analysing a system's state ('deep' or 'simple' are the options) reveals the tools Iolo has collected under the 'tune-up' part of the program. System Mechanic can find and fix registry errors, scan for system clutter (like temporary files), and check for and try to fix hard drive errors. It can defragment



drives, back up the registry and generally provide a sense of calm assurance. Yet, beyond these more usual tasks it checks for suitable driver updates, scans for dangerous, unnecessary or redundant start-up programs, and checks you've active anti-malware and firewall software running.

If this now seems a bit more than the usual tune-up fare, it's because Iolo is seemingly obsessed with performance and reliability. The company clearly wants to ensure that your system is kept in the best form possible. It wants that without you needing to know about

hidden Windows tools and CMD commands, and frankly System Mechanic is rather good at it. Sure Iolo wants you to buy its wares, but really the tools on offer are pretty persuasive and do provide tangible benefit. The Memory Mechanic tool frees up your RAM and reallocates it based on need with the click of a button.

The program's RAMJet technology will snatch away program memory from idle programs in real time, and similarly move the resources where they're needed. Equally optimisation-obsessed is with the software's OptiCore technology which focuses your

processor on active tasks, and provides a feel that – especially with underpowered machines like my laptop – what you're actively working on is the most important thing for your system. 'PowerSense' intelligently unparks processor cores, and System Mechanic also provides power states related to the type of action you engaged in with Live Boost.

There's a lot going on here. System Mechanic wants to aid you with speed and reliability, but also privacy and security offering a useful overview of your system state and the tools to improve it. In truth 14.5 (like version before it) has a solid amount to offer for its price... but there's little new. The one addition is named Net Booster, and is designed to bump your Internet connection through optimising TCP/IP. Unfortunately, although its intentions may be honourable its impact appears rather negligible. Which is a shame.

It offers no real incentive to upgrade, but then existing users with an active subscription do so automatically. For anyone else, System Mechanic gets a recommendation from me. It's highly useful in keeping systems in tip-top form, and with any version of Windows that's what we should all aspire to.

mm Kevin Pocock

A smart virtual toolbox to enliven your system



DivMMC EnJOY! Black Edition

Time to blow the dust off the old Spectrum, there's much gaming to be had

DETAILS

- Price: £60
- Manufacturer: Ben Versteeg
- Website: goo.gl/3gt2C5
- Required Spec: 16K, 48K, 128K, +2, +2A, +2B, +3 ZX Spectrum,

It's no secret that we here at *Micro Mart* are extremely fond of the ZX Spectrum.

Our collection of Spectrums occasionally get an airing from their preserved cases, usually when we come to showing them off to whoever takes a passing interest. Sadly, we don't often use them for gaming much these days.

The problem comes in the form of finding a reliable tape and cassette recorder, plus there's the box full of various interfaces that will either do nothing at all or cause the Spectrum to explode in a myriad of clashing colours on the connected TV. Therefore, we usually just have these wonderful machines as show pieces.

However, we recently had the good fortune to be sent a device that could soon change that situation and have setting

up the old 128K 'Toastrack' on a more permanent basis.

The DivMMC EnJOY! Black Edition is an amazing device that plugs directly into the expansion port of any ZX Spectrum (from 16K through to the +3) and offers the user access to an SD card and

external operating system to load up their collection of games or programs within seconds.

The device itself is the brainchild of Ben Versteeg, who originally started producing the predecessor to the DivMMC – the DivIDE – a few years ago. As the older technology used in the DivIDE began to phase out, Ben opted to update the design of the device to cater for faster and more capable SD cards. He self-assembles each unit, 3D prints the case and flashes the chip inside the DivMMC with ESXDOS 0.8.5, a firmware operating system used in modern day Spectrum storage systems.

The end result is a fascinating product that's expertly designed and built and which fits comfortably to the back of a Spectrum as if it had been manufactured with the system thirty years ago. It features a slot at the top where the SD is inserted, a Kempston 9-pin



joystick port, a pair of LEDs indicating power and access to the SD card and two separately coloured buttons to access the ESXDOS menu system and to hard reset the Spectrum and re-initialise ESXDOS.

There's plenty of room in the design to plug the joystick in and access the SD card while it's housed in the Spectrum. A clever design point we found was that the DivMMC is raised just enough to lie flat on a surface while plugged in the Spectrum, this means you can plug or unplug the joystick and press the buttons on the device without it wobbling in the expansion port and ultimately causing the Spectrum to crash – something which many of us will no doubt have experienced with other peripherals in the past.

Operating the DivMMC is easy. All you need do is select the model of Spectrum from the set of jumpers located to one side of the unit, as indicated in the accompanying manual and labelled by the switches, then plug the device into the expansion port and power up the Spectrum.

As the Spectrum boots ESXDOS will check and mount the SD card, then drop you into the Spectrum 48K BASIC mode. From there you have a number of choices to load content from the SD card; you can simply press the NMI button on the DivMMC, and you'll instantly have access to the ESXDOS menu system, which you can use the arrow keys and Enter



Features

- Integrated Kempston Joystick interface
- Reset switch
- NMI button for a quick file access
- Very fast: load games in seconds!
- Comes with the best software: ESXDOS
- Compatible with all ZX Spectrum models: 16K, 48K, 128K, +2, +2A, +2B and +3
- FAT and FAT32 compatible – easy file transfer!
- Support for various emulator formats: .TAP, .SNA, .TRD and more!
- New and easy BASIC commands and many fun and useful tools!
- Create snapshots to continue a game later!
- Write support to SD card with easy commands!
- Updates are still being developed; installing an update is easy!



to navigate and load any games or demos.

The second method involves using a selection of newly added BASIC commands, thanks to ESXDOS. The commands are familiar and consist of Cat [drive], Goto [drive]"path" and Load path/filename; using the asterisk as the current drive – Load */"/games/manicm", for example. There's even a command that allows you to save directly from Spectrum BASIC to the SD card, and you can also use CD (change directory) and LS for directory listings. Suffice to say, anyone with some basic grasp of the command line will be able to navigate through the ESXDOS Spectrum filesystem.

There's an immense joy to be had when you scroll through a list of games and load them up instantly with the press of the Enter key. There's also the added benefit of using your original Spectrum and joystick; none of this emulation lark!

Although amazing in nearly every way, there are some limitations. Thankfully these only extend to the software and not the hardware side, but it does mean that there's no support for long filenames, wildcards, 64K clusters, extended partitions, and 128K BASIC isn't yet supported, although 128K programs and games are.



“It's brought a new lease of life to our prized collection of dust gathering Spectrums”

ESXDOS, though, is a project that is alive and well, which means that when an update is released you can enter developer mode via the jumpers and flash the DivMMC to the latest version. Later versions, then, may well address any software limitations it has.

This is one of the most enjoyable devices we've ever had through our doors. It's brought

a new lease of life to our prized collection of dust gathering Spectrums, as well as many more hours of Spectrum gaming that we didn't honestly think we'd get around to enjoying ever again. With support for TAP, SNA, Z80 and SCR files and full FAT16/32 read and write support, game snapshot mode and an excellent design, the DivMMC EnJOY! is a well-priced, must have device for

any retro enthusiast or anyone who simply loves to enhance their current collection.

mm David Hayward

A superb addition to anyone's collection, and a wonderful device to own



GROUP TEST

Sub-£400 Refurb PCs

We have a confession. We thought a refurbished PC would be an ugly mess of pre-loved and much abused business systems. How very, very wrong we were.

Refurbished computers are an excellent choice for buyers on a budget and are virtually spotless examples of superb PCs.

David Hayward has five to try out, with a maximum budget of £400, to see which might tempt him to part with his cash.

Sub-£400 Refurb PCs

MicroDream M91p

DETAILS

- Price: £324.86
- Manufacturer: Lenovo/MicroDream
- Website: goo.gl/nFTpEU
- Required spec: Internet connection, Office suite, upgrade options available

MicroDream is a Devon-based company that has been in business since 2009 and in that time it has achieved quite some status among system builders and those looking to grab a refurbished bargain.

The system it sent to us came well under the £400 limit we had set, totalling £324.86 with delivery. For that you get a refurbished Lenovo ThinkCentre M91p, a small-form factor business machine with an Intel Core i5-2499 3.1GHz processor, 4GB of DDR3 memory and a 250GB Western Digital Caviar Blue SATA drive on which you'll find a pre-installed version of Windows 7 64-bit – all you need to do is enter the COA licence when you first boot up.

As well as that, you also get a 20" Dell TFT monitor, a low-profile PCI wireless adapter, a USB Bluetooth adapter, DVD writer, wireless keyboard and mouse, VGA cable and power, and a pre-built recovery partition on the hard drive together with tools to create a rescue disk or USB.

Added to that, MicroDream also offers a lifetime warranty for a further £99.99, should you want peace of mind from your system. It's really quite a remarkable setup and one that we were very pleased to see on offer.

Naturally, the PC itself isn't the most powerful system ever



conceived, and in all honesty it wouldn't score within the top ten of the 3D Benchmark tests, but that's not the point here.

There's also the added benefit of with this being a former business machine; there's a good chance that the most recent version of virtually any Linux distro will install comfortably and without any of the usual driver irritations you're likely to come across with a brand new motherboard and system.

Furthermore, if you wish, you could always opt for a low-profile dedicated graphics card, which will boost the capabilities of the machine greatly.

The presentation of the MP91p is as near perfect as the list of specifications and the price. There were no scratches, marks or other evidence that this was once a machine that graced the desks of a company somewhere. In short, it was immaculately turned out, both inside and out.

MicroDream has set the bar for this group exceedingly high

“ In short, it was

immaculately turned out, both

inside and out ”

What matters is that this is a system which, including the lifetime warranty, you can have for less than £400. And there's probably change left over for a Microsoft Office licence or you can simply opt for Libre Office or any of the other equally capable open-source office suites.

The Windows 7 64-bit licence is a handy thing to have, and when installed on the MicroDream M91p it works very well indeed. Every program we ran, as a brief test, performed well enough. For the average user, student or someone who requires a small footprint PC for a particular task, this is an ideal example.

with the M91p. A thoroughly good machine with everything you could ask for, at a price that's affordable and sensible.



Tier 1 Lenovo T430

DETAILS

- Price: £399
- Manufacturer: Lenovo/Tier 1
- Website: goo.gl/8j86n0
- Required spec: Internet connection, office suite



Tier 1 is another long-established company, dating back to 1995, which has been

involved in the safe disposal of office equipment for large corporations, banks, educational organisations and public companies. So you can be sure you're in good hands.

Tier 1 sent us a laptop in this instance, a Lenovo T430, often described as the king of the 14" business notebooks. The T430 received some flak when it was introduced some years ago, purely due the entry-level screen and odd keyboard layout, but we feel that was a little unfair. Personally, we always found the screen quite good and the keyboard nicely laid out and easy to type away on.

This particular model comes with an Intel Core i5-3320M

2.6GHz processor, a decent 8GB of memory and a 240GB Intel 520 SSD complete with Windows 7 Pro 64-bit and recovery partition. Added to that you'll find a DVD burner, 720p HD web cam, 4-in-1 card reader, Ethernet port, 802.11 b/g/n wi-fi, a pair of USB 3.0 ports, a single USB 2.0, VGA and a mini DisplayPort with audio. All in all, it's a perfectly fine laptop, and as Lenovo has proved in the past with the T-range of laptops, it's of a pretty tough breed.

The chassis of our Tier 1 example was immaculate; even

the DVD tray was free from scratches and blemishes. The only noticeable evidence that this was a 'preloved' system was in the top corner of the trackpad, where the textured surface was a little worn down. Beyond that, you'd be hard pressed to find anything wrong with it.

The battery included with this model is the six-cell version, which gives a good five to six hours of life before you'll need to plug it back in again. Obviously, if you're pushing the processor, then it drains a lot faster, but on the

whole, and considering this is a refurb unit, the battery is capable enough.

The 14.1" screen, which caused some issue when the T430 was released, is a clear 1600 x 900 display with little to no reflection and not a dead pixel in sight. Everything else on the system worked perfectly fine, and Tier 1 even included the original Thinkpad SimpleTap tile based, quick launch application, complete with mouse gestures, as a part of the Windows 7 build.

The Thinkpad T430 from Tier 1 comes in at a healthy £399, reduced with a promotional code from £499 (the promo code is MMPROD192, by the way), but it does have a 12-month warranty as standard with the option to increase the warranty to two years for an extra £25, and three years for an extra £40.

It's a good deal, and for £400 you'll have an excellent, reasonably lightweight laptop that's capable of seeing you through university or school or just serving as a household computer. Even if you factor in a laptop bag and a copy of Office (if Microsoft is an absolute must), then you're still left with a superb setup.

The Lenovo T430 from Tier 1 therefore is certainly worth looking into, and the discount is one not to miss.



Sub-£400 Refurb PCs

Pure IT Refurbished Dell Optiplex 790 SFF

DETAILS

- Price: £333.50
- Manufacturer: Dell/Pure IT
- Website: goo.gl/2MYNs3
- Required spec: Monitor, keyboard and mouse, office suite



Pure IT Refurbished, the trading name of Pure IT Recycling Ltd, has been in business since 2007 and is licensed by the Scottish Environmental Protection Agency. This naturally means you'll be getting a first class service, from the minute you visit the site, through a helpful chat client, to the moment your refurbished machine is delivered to your doorstep.

Pure IT Refurbished sent us the small but remarkably powerful, Dell Optiplex 790 small-form factor desktop. This tiny unit packs a decent punch, with an Intel Core i5-2500 quad-core 3.3GHz processor, 4GB of DDR3 memory and a new 256GB Crucial SSD, on which you'll find a copy of Windows 7 Pro 64-bit.

As well as that, you also get a slimline DVD burner, gigabit Ethernet, ten USB 2.0 ports, VGA, DisplayPort, and for those of you with legacy hardware, a serial port. In terms of the software, aside from Windows 7, Pure IT also bundles a copy of OpenOffice 4.0.1 and has the system up and running with a default user ready for you to simply plug a monitor, keyboard and mouse into.

This particular machine comes with a two-year warranty, with the guarantee that should anything go wrong, then Pure IT Refurbished will try to resolve the problem over the phone or

get a replacement out to the customer within 48 hours.

As with the other examples we've seen so far, the Dell Optiplex from Pure IT Refurbished looks almost brand new. The chassis is clean, free from scratches and blemishes and is immaculately presented both inside and out. The only evidence we found that this was once a machine that belonged to someone else, whoever that may be, was a slight mark from where an asset sticker may have once belonged, at the rear of the machine. Otherwise, it was perfectly fine.

The Dell Optiplex 790 is a great little machine. The small footprint means you'll have more desktop space, and it's reasonably powerful too. If you so wanted, you could happily improve the performance with the addition of a low-profile dedicated graphics card, or for £42 more you can add an extra 4GB of memory. We've used Optiplex 790 SFF systems in the past and found they make ideal home theatre PCs or retro emulation machines for large screen gaming, thanks to the size of them and the fact that they have four USB ports located on the front of the case



“ The small footprint means you'll have more desktop space ”

where you can plug in your controllers.

The system itself comes to £240, then with the SSD upgrade at £85 and delivery at £8.50, the grand total is £333.50, which gives you change from the £400 budget to go out and get a keyboard, mouse and monitor – unless you use it attached to the TV, in which case a low-profile graphics card can be factored in.

We were quite satisfied with the Optiplex 790 SFF system from Pure IT Refurbished. These are machines we've used in

the past, and we know how solid they are, and for less than £350, this is a bargain that's worth every penny.



Morgan Computers Fujitsu EsPrimo P910

DETAILS

- Price: £329.95
- Manufacturer: Fujitsu/Morgan Computers
- Website: goo.gl/Nm06hg
- Required spec: Monitor, keyboard and mouse



Of all the refurbish companies in this group, Morgan Computers is by far the oldest, having started life in Tottenham Court Road some 30 years ago, selling second-hand and end-of-line PCs. It's fair to say, then, that as a company, Morgan has some expertise in the sale of refurbished equipment.

The unit Morgan Computers sent us was a pleasant change from the batch of Lenovos and Dells we'd encountered so far. The Fujitsu EsPrimo is actually a part of Fujitsu's superior range of business desktops, offering

delivery of an added £6.99. That's not a bad price when you consider the system you're getting. This is a tower that can accommodate a full-sized graphics card and has plenty of other upgrade potential. It wouldn't cost too much to turn the Fujitsu P910 into a half-decent gaming machine. In fact, you could probably get away with it well within the £400 budget range we've set.

The chassis of the Fujitsu P910 did show some signs of wear, but only around the plastic edges of the trim, and these were only blemishes rather than scratches. Otherwise it was a perfectly turned-out example of a power machine that has been given a new lease of life.

The Fujitsu P910 from Morgan Computers can be seen as a more classic desktop unit, over the previous refurbished stock we've looked at – except the laptop, of course. This instantly makes it a little more appealing to those who want a cheap but powerful base on which to build a project, be that gaming, server based or more demanding office work. That, however, depends on the individual and the use they plan to fit the system into.

On its own, this is a good refurbished unit that's well presented and with heaps of potential. Another good choice for most users.

“ This is a tower that can accommodate a full-sized graphics card ”

a solid hardware base that's easy to manage and can be tweaked for more powerful and demanding applications.

In this case, the system features an Intel Core i5-3470 3.2GHz quad-core processor, a decent 8GB of DDR3 memory and a Seagate Barracuda 500GB hard drive on which you'll find an installation of Windows 7 Pro 64-bit.

In addition there's also a DVD reader, plenty of USB 3.0 and 2.0 ports and gigabit Ethernet. Also, because this is based on a Fujitsu D316 motherboard with an Intel Q77 Express Chipset, you get a pair of PCIe slots, with

the potential to fit a CrossFire or SLI graphics setup. Mind you, you'll have to improve the power supply beforehand, but it's possible nonetheless.

Windows 7 boots you straight to the desktop and has a number of program installation icons to choose from. They include AVG, Malwarebytes Anti-Malware, Libre Office, Chrome and Foxit Reader, and whether or not you decide to install them is purely down to you.

The P910 from Morgan Computers comes with a six-month warranty, and costs just £329.95, with a courier



Sub-£400 Refurb PCs

Gigarefurb HP 8200 Elite

DETAILS

- Price: £246
- Manufacturer: HP/Gigarefurb
- Website: goo.gl/WvDZHO
- Required spec: Monitor, keyboard and mouse

Gigarefurb is a Manchester firm that collects redundant kit from offices across the country and applies its own special brand of wiping and cleaning, as well as bringing them up to a more modern and capable specification, while still amazingly keeping the cost of the systems as low as possible.

The system Gigarefurb sent to us was an HP 8200 Elite SFF system, complete with a 3.1GHz Intel Core i5-2400 processor, 8GB of DDR3 memory and a Western Digital Caviar Blue 250GB hard drive. Windows 7 Pro 64-bit comes pre-installed, along with a recovery partition that can be accessed at boot.

Along with the core specifications, you'll get a DVD burner, gigabit Ethernet, Intel HD 2000 graphics and a 12-month return-to-base warranty. With this being the SFF version of the HP 8200 Elite range, you'll also get a pair of PCIe slots, PCI, PCI 1x and four banks of RAM slots. And it's also Red Hat and SUSE certified, should you prefer to install your own flavour of operating system.

The HP 8200 is an exceptionally quiet machine; you'll need to put your ear by it to make sure it's on. Combined with the small footprint and the fact the 8GB of memory helps the OS zip along nicely,



“ Performs admirably without the need to constantly fiddle with it ”

this makes the system an excellent choice as a powerful media centre. If you include a decent low-profile graphics card, then there's no reason why it won't double up as a mid-range gaming system too.

As with the other systems, the example from Gigarefurb was remarkably clean, both

inside and out. There were no discernible marks or scratches, not even the ghostly remnants of an asset sticker, and the motherboard and internal components looked like they'd subjected to a forensic cleaning. It's really quite hard to believe that this was once a machine that lived on

someone's desk somewhere in the UK.

The cost of the system comes to £246, with the option to upgrade your warranty to two or three years at £53.99 or £71.99 respectively. You can also choose to have MS Office 2010 installed for £95.99 or the operating system upgraded to Windows 8.1 for £117.59. On top of that, you can choose various hardware upgrades, such as hard drive sizes, RAM, wi-fi, keyboard and mouse and a monitor, all at very reasonable prices. Put simply, there's enough here to upgrade to an even better system all within the £400 limit.

Gigarefurb has laid on a good choice of systems here. The HP 8200 Elite is a tough, dependable PC, and it performs admirably without the need to constantly fiddle with it. The company website too is simple to use, easy to navigate and includes any optional extras.

All in all, our experience with Gigarefurb was a pleasant one, and if the rest of its systems are as well presented as this one, then you've got yourself a bargain.





MicroDream M91p

This is by far the most difficult group we've ever had to mark. All the systems presented were fantastic.

Nevertheless, we thought the MicroDream system just managed to pip the rest to the post here, mostly due to the extras and the amazing lifetime warranty on offer.



Pure IT Refurbished Dell Optiplex 790 SFF

If picking the best overall was difficult, the impossible task of choosing the highly commended entry made us want to lock ourselves in a darkened room for a while.

However, we picked the Dell Optiplex from Pure IT, the reason being that the Dell 790 SFF is a superb lightweight system for a number of tasks, and the two-year warranty as standard is commendable.

How We Tested

Luckily, each of the refurb units was already set up and ready to go. With the exception of the units from MicroDream and Tier 1, they all required a monitor, keyboard and mouse.

All systems were booted and checked for a Windows activated licence. We also checked the systems exterior for blemishes and opened them up to see the state of the interior and to potential for extra hardware upgrades at some point in the future.

	MicroDream Lenovo M91p	Tier 1 Lenovo T430	Pure IT Dell Optiplex 790	Morgan Computers Fujitsu EsPrimo	Gigarefurb HP 8200 Elite
Price	£324.86	£399	£333.50	£329.95	£246
CPU	Intel Core i5-2499 3.1GHz	Intel Core i5-3320M 2.6GHz	Intel Core i5-2500 3.3GHz	Intel Core i5-3470 3.2GHz	Intel Core i5-2400 3.1GHz
Memory	4GB	8GB	4GB	8GB	8GB
Storage	250GB HDD	240GB SSD	256GB SSD	500GB HDD	250GB HDD
Chassis Form Factor	Small form factor	Laptop	Small form factor	Tower	Small form factor
Upgradable: Graphics Etc?	Low-profile graphics, memory, HDD etc.	Limited due it being a laptop, storage, optical drive	Low-profile graphics, memory, HDD etc.	Graphics, HDD, memory etc.	Low-profile graphics, memory, HDD etc.
Installed OS	Windows 7 64-bit	Windows 7 Pro 64-bit	Windows 7 Pro 64-bit	Windows 7 Pro 64-bit	Windows 7 Pro 64-bit
Warranty	Lifetime	12-month standard, upgradable	2-year, upgradable – resolved within 48 hours	6-month	12-month RTB as standard, upgradable

Your Letters

Ancient Computers

I was interested to read JJ Reynolds' letter in issue 1353, following the 'Ancient Computers Still in Use' article. As an ICL mainframe user, and subsequently an ICL employee, I have a few comments on his recollections of the 1900 Series, George II, and the 2900 Series and its operating system, VME/B.

The 1900 Series, of which the 1906A was a member, was developed from the Ferranti-Packard 6000. It features a 24-bit instruction/word length, NOT 48-bit as JJ Reynolds remembered. For calculation purposes, double-length integers and floating point numbers (both 48-bits wide) could be used. These were most likely to be used by Fortran programs, which he remembers as his introduction to programming. With a maximum addressing capability of 22 bits, the instruction set could address four million 'words' – or 16 megabytes. (In fact, the largest 1900 system had only 512k 'words' of memory or two megabytes). Most commercial programs used 15-bit addressing – which gave 32,767 'words' or 128k bytes. This was certainly enough for online transaction processing systems (OLTP), supporting hundreds of interactive terminals.

At the time of JJ Reynolds' introduction to computing in 1979, the 1906A he began to use was a little long in the tooth, having first been introduced in 1970. The 2900

series (or 'New Range') was introduced in 1975, including its operating system, VME/B. This was a 32-bit operating system, built completely from scratch, rather than being developed from anything used on the 1900 Series. The relative age of the 1906A, and the fact that the 1900 Series hardware was not being further developed, is probably the reason that his company was recommended to replace the 1906A with a 2960.

I was surprised to read that JJ had such difficulties using VME/B, after having used George III on the 1906A. His example was the difficulty he found in creating a file, which he seemed to remember taking '14 separate steps'. VME/B was block-structured, meaning that resources were allocated and released within 'blocks' bounded by 'BEGIN' and 'END' statements. It was seen as good form to always start a couple of blocks after logging in, in case you got yourself 'in a knot' and needed to release a resource of one form or another. This could be accomplished by typing one or more 'END' statements.

The development environment on VME/B was one of a set of services available to any authorised user. After logging in with a valid username/password combination, a prompt would appear, similar to any other development system. So from logging in, to create a file you would type:

```
BEGIN;BEGIN
INF(filename)
.
.
.
****
```

Commands in VME/B had a long-form and normally one or more synonyms or abbreviations. The command 'INF' above is a synonym for 'INPUT_FILE', which if all other parameters were defaulted, would allow the user to input the file a line at a time, followed by a single line containing four asterisks. This is almost 100% equivalent to the George III example in the earlier letter.

JJ Reynolds is correct in his understanding that computers of the time had different operating systems etc. A more fundamental difference was the internal character representation used, which meant that binary data in particular, and even character data, were different on many systems. For example, in the case of the 1900 (George III) and 2900 (VME/B) systems, the following [table at the bottom of this page] was true.

The 'Windows' column is included for comparison.

If character data on the different systems is sorted,

character 'zero' is lower in value on 1900 (and Windows) than character 'A', whereas on 2900 (VME/B) the reverse is true. This sort of situation was common before the near-monopoly of x86/ASCII systems and led to many integration/migration issues.

It should be noted that the 1900 order code continued beyond the actual 1900 Series hardware. With 'Direct Machine Emulation' (DME), 2900 Series hardware continued to run existing 1900 Series programs. Subsequent developments (Concurrent Machine Environment (CME)) allowed both VME and DME to run concurrently on the same hardware. Smaller business-type systems, suited more to an office environment, rather than large air-conditioned computer rooms, were also offered (2903/4 (1976) and ME29 (1980)). When the 2900 Series was itself superseded by the Series 39 in 1985, CME* (CME 'star'), allowed ME29 software to run unchanged. Orders were still being taken for packaged software on CME* in the late 1990's.

If JJ Reynolds is still nostalgic for his Fortran programs on

Value	1900 (George III) [6-bit octal]	2900 (VME/B) [EBCDIC]	Windows [ASCII]
Binary zero	*00	X'00'	X'00'
Character zero	*00	X'F0'	X'30'
Character 'A'	*41	X'C1'	X'41'

George III, all is not lost. A Windows-based emulator for 1900 Systems is available from www.icl1900.co.uk, with a George III system retrieved from the last working UK example. I was in contact with the webmaster for the site last year and provided him with a Fortran source for the old 'Adventure' game, which he was able to compile and run on George III, 50 years after the first 1900 system became available.

VME/B is still alive and well, albeit running as an application (emulated environment) on x86 hardware.

Further information about the 1900 Series is available at www.icl1900.co.uk and homepage.ntlworld.com/v.pasquali.

Richard Stewart

What's Up POP?

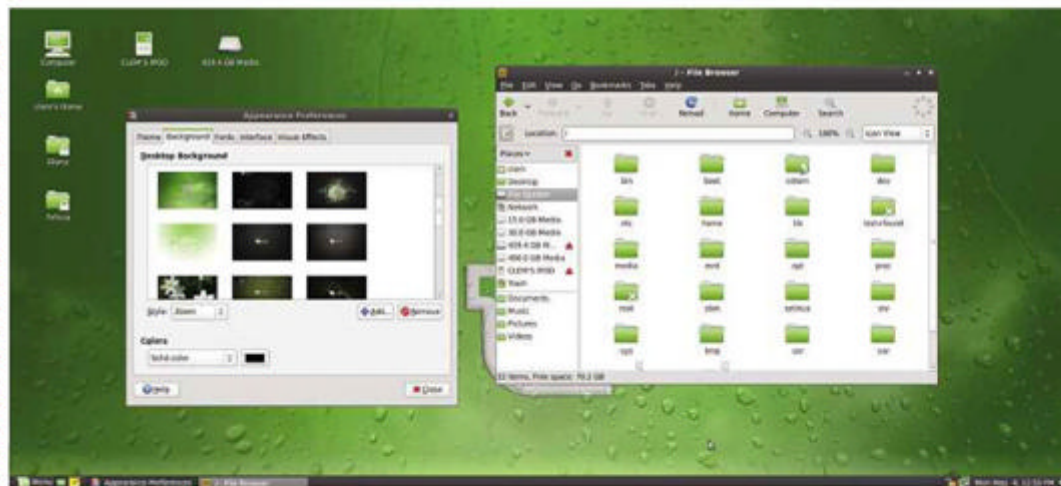
I downloaded Windows 10, and I thought it was great, until I tried to install my email. Windows 10 does not support POP.

I have been using POP since Windows 98, now I can only get my email if I have an Outlook account. I and thousands of others do not have Microsoft Office installed, so how to get Outlook without it? I am old and do not follow the instructions.

Microsoft says I must ask my internet provider to change my internet from POP to IMAP.

Microsoft cannot realise the amount of customers that will have to change from POP to IMAP; this will make a tremendous amount of work for the internet providers, and it could take months to change the thousands of customers who use POP. Due to this, I will not be upgrading from Windows 8.1

Ted Oswald



Why I Use Linux

In issue 1354 David Haywards asked for feedback as to why we use Linux, and when I say Linux this is shorthand for GNU-Linux. My story started in 2007. When I had some spare time, I got an old p2 300 PC, which had been my late mother's, working again and decided to give Linux a go on it. I had been following Phil Thane in Micro Mart for some time and felt it was time to dip my toes in the Linux pond. I installed Xubuntu onto the PC, and it ran like a dream with only 256MB of RAM. I subsequently gave this PC away on Freecycle (now Freegle) as I had some time on my hands, because I was between work and going back to uni. I posted on Freecycle for any old PCs that people might have, and I said I would get them up and running to give back on Freecycle. Well, the response was good, and I was able to refurbish several PCs, and as they were all low spec for the time they all got Xubuntu installed, which also meant they could have an up-to-date OS and all the software needed for the end user and all completely legal, which is a requirement of Freecycle rules for anything posted.

As a result of my Freecycle posts, I met a few other like-minded folk, who gave me a lot of help as a noob. It was with their help that I learned how to

get DVD playback working and other useful tips. As a result of this support, that summer and the following summer, I gave over 20 PCs away from parts donated by Freecycle users.

During this time I also started to dual boot Linux on my own system and found that over the next two years I spent most of the time in the Linux partition and less and less running Windows. In April 2009, I had a PC meltdown and had to do a full reinstall and went with a full Linux box running Windows XP in a virtual machine. That was Ubuntu and I've been solely a Linux user ever since.

I now run Linux Mint with the Mate desktop, as I like the more traditional user interface. All the tools I need are available in Linux, even photo software for managing RAW workflow. I use Libre Office for all office tasks and Firefox for internet access, Thunderbird as my mail client and loads of other applications for whatever I need at the time, Linux just works, and the OS keeps out of the way until needed.

I have become a member of my local LUG/Makerspace in Blackpool, and we're active in helping local young people learn about Linux and open-source software through the use of the Raspberry Pi, which until the recent pi2 only ran open-source software and was mainly Linux

based, although there is also RISC OS available for the Pi.

I still install Linux on PCs I give away through Freegle, and generally this is not a problem for the end users, as they're usually second or third PCs for use by children as a homework machine. I also put Linux on friends PCs/laptops if asked to rescue old hardware, and as a result, I've have made a few converts, although I do this because often I'm given PC's without a valid Windows COA and they don't want to pay for a Windows licence – not that I'm out to convert the world to Linux (Android has done that already).

Tony Hughes

GET IN TOUCH...

By email

letters@micromart.co.uk

By post

Micro Mart
30 Cleveland Street
London
W1T 4JD

Online

forum.micromart.co.uk

SUBSCRIBE NOW!



Subscribe to **micro mart** today and save on the single issue price.

Each issue of *Micro Mart* will be delivered directly to your device each week.

SEE NEXT PAGE FOR SET-UP INSTRUCTIONS

HOW TO SUBSCRIBE...

...on an iPad or iPhone

- STEP 1** Return to the *Micro Mart library*
- STEP 2** Choose your subscription term and tap twice on the 'price' box
- STEP 3** Choose whether to create an optional [PixelMags](#) account
- STEP 4** Enter your [Apple ID password](#) to confirm



...on a Kindle Fire

Kindle Fire subscriptions come with a **FREE** one month trial.

- STEP 1** Tap '[Free Trial Subscription](#)' in the *Micro Mart library*
- STEP 2** Chose your subscription term from the drop down menu on the popup that appears
- STEP 3** Tap '[Subscribe](#)'



...via the Zinio app

- STEP 1** Search for *Micro Mart* via the search box in the [Shop tab](#)
- STEP 2** Tap the '[Subscribe](#)' button
- STEP 3** Choose whether to create an optional [Zinio](#) account
- STEP 4** Enter your [Apple ID password](#) to confirm



Subscribe to *Micro Mart* today and save on the single issue price



Upgrading A Laptop With An **SSD**

Mark Pickavance talks about some clever methods to add an SSD to a laptop that potentially wasn't designed to take one

Very often upgrades deliver only modest improvements in performance, where benchmarks are usually needed to appreciate the effect. One of the exceptions to this is SSD drives, as they outperform their mechanical drive counterparts often by 300% or more. As a result the system boots more quickly, apps launch almost instantaneously and, as an added bonus, they use less power, extending the battery life.

If there is a downside to them, it's the cost per GB that often leads people to go with smaller capacities to make them an affordable upgrade. In an ideal scenario what you really want is your operating system and apps on the SSD, and your data on a second much larger physical hard drive. That's a great plan if your laptop supports multiple 2.5" drives, but what can you do if it doesn't? As Baldrick might say, I have a cunning plan!

One Drive, Two Faces

There is one way that you can get two drives in a single slot, if you're prepared to invest in the right device for the job. Western Digital makes a drive called the Black² Dual, which on the outside has the physical specifications of a single 2.5" (9.5mm thick) drive. But inside it mounts a thin 1TB hard drive and a 120GB SSD, both of which are accessible through the single SATA connection. The cost of this is about £150, and you effectively get the best of both worlds, without having to solve the problem of where to locate the SSD drive. Unfortunately, as magical as this sounds, it isn't the perfect solution that

it firsts seems, because to achieve this feat, a number of compromises have been made.

The first and most apparent is the size of the SSD, at just 120GB. That's enough for an operating system and a few apps, but it could soon be a little snug for most well-used systems. If you can live with the size, you'll also discover that this isn't the quickest, reading at about 350MB/s and writing at 150MB/s. Some of the lack of punch may come down to the two drives sharing the bandwidth of one SATA connection, but that isn't the whole story. The hard drive also isn't very quick, when compared with 7200rpm units. Boot speeds will be improved with the Black² Dual, but it won't offer the same level of performance that an independently connected SSD and hard drive combination can deliver. Where it can find use is in those laptops that simply have no other options, like small notebooks where there isn't even an optical drive to usurp – which neatly brings me to the second way to increase drive options, for laptops that include a removable optical drive.

DVD Slot Reuse

Many larger laptops have either an optical drive or the slot to mount one into. The size and shape of these drives was standardised, so that should the drive malfunction you could replace it. They're generally 12.7mm high, and have a distinctive rectangular shape with one corner angled. They come in two types, PATA and SATA, and it's the SATA one that you need if you're going to reuse that slot for an SSD drive. Where laptop

makers diverge in this design is in the tray cover, because that is made specifically to fit the profile of the machine.

Therefore if you do this you'll need to remove that cover from the optical drive, if you want the replacement part to look like it's part of the PC. These optical drive caddies are easy to come by and relatively inexpensive. A cheap one can be had for less than £10 off eBay, yet these probably aren't the quality of product that I'd recommend. If you'd like something made by a reputable company, Icy Box makes the IB-AC642, which will set you back about £23. But by far the best ones I believe are made by a company called HDDCaddy (hddcaddy.eu), and these cost somewhere between £18-£25 plus shipping. What's nice about the HDDCaddy products is that they're tailored for specific laptop designs and include clever fixes for things like shutdown problems and other idiosyncrasies.

Once you have one of these, it's generally just a matter of installing the SSD drive with a maximum thickness of 9.5mm into the caddy and then inserting it into the PC. While the interface is very often hot-swappable, I'd generally turn the machine off to do that. Once the system runs it should identify the new drive, and you can start the procedure to transfer it over to the SSD using a migration tool like Acronis TrueImage or Paragon Migrate. There are, however, a few things you need to be aware of before doing this, especially if you intend to ultimately make the SSD bootable.

If the OS boots from the SSD on the caddy, you can't then suddenly swap the DVD back in if you need to read or write some optical media. That might be a problem, the solution for which is to swap the SSD and the internal drive around so that you can remove the drive the system isn't dependent on to run. That's also a good idea for another reason, which is that very often the SATA standard on the DVD drive bay may be original SATA or SATA-2, and not SATA-3. If the standard is say SATA-2, you'll find that the SSD tops out at about 350-375MB/s, even if you've bought one that is rated to 500MB/s or more. Some research as to what you might expect is in order, as it will guide you to decide where it is best to place the drive, internally or in the caddy. As most hard drives can't exceed even the bandwidth of original SATA, the performance in the external caddy of a hard drive should be unaffected. There are also those machines where the BIOS is geared to boot off the internal drive and needs altering to change the boot target. That might seem simple, but whereas desktop PC owners are encouraged to explore their BIOS settings, on laptops it's actively discouraged. How well this ends up working entirely depends on the laptop you've got, the caddy you buy and if you're prepared to swap the internal drive over to get the very best performance.

“ Many larger laptops have either an optical drive or the slot to mount one into ”



Putting your old drive in a optical drive caddy could solve a heap of problems



With the Crucial MX200 just launched, this might be the right time to snag an MX100 bargain



Hybrid Drives

So far I've presented the idea of either using a special SSD/HDD combined or subverting the optical drive slot, but these aren't all the options available. One neat possibility is hybrid drives, which combine conventional disk technology with a little SSD fairy dust. Of these, the best know is the Seagate SSHD; a 1TB model will set you back around £70 from a competitive retailer. This is the second generation of a design that started out life as the 'Momentus XT', and it fuses flash memory and spinning disks in an interesting way.

Along with the hard drive, Seagate built into its SSHD designs 8GB of MLC flash and 64MB of RAM, to lubricate the operations. It might seem a little odd, but in general it works very well, and I'm always amazed that these drives weren't more popular than they were. What's great about these drives from a user perspective is that there is no size adjustment needed, as the SSD part of the mechanism is invisible to the user. All they experience is the performance boost that the flash memory gives to the conventional drive, which is substantial.

For those interested in this type of solution, Toshiba also makes a range, and Seagate has 2TB and 4TB 3.5" models specifically for desktop use. SSHD drives are a good choice if you have a notebook that doesn't possess an optical drive slot and you don't fancy the cost of the WD Black² Dual. While you don't get the blinding speed of a pure SSD, you do get a decent enhancement, the cost is very cheap and you aren't required to reorganise your system to cope with two drives. They don't offer the power advantages of an entirely solid-state solution, but they are substantially cheaper than buying a 1TB SSD.

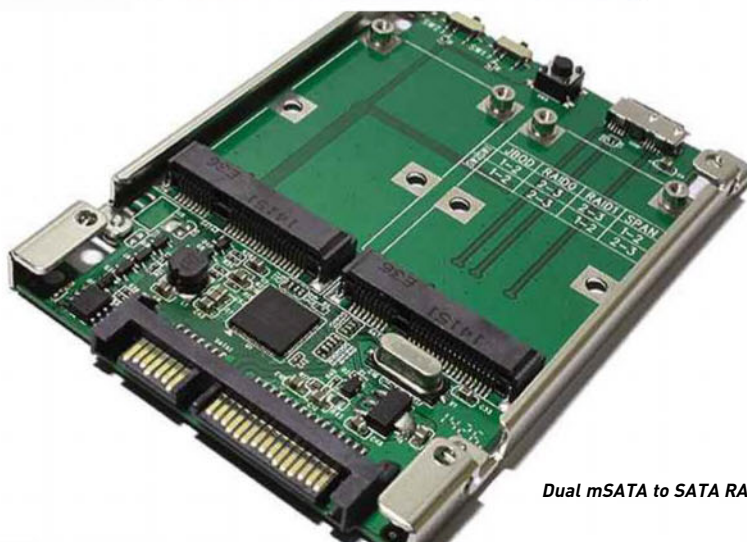
mSATA Options

To make this article comprehensive, I've also decided to include some of the less conventional means, even if they're not very practical. I'd firmly put mSATA drives in that category, because while you can do what I'm about to explain, there are substantial caveats to doing so. For those who haven't encountered it, mSATA is a flavour of SATA where the drives are just 1.8 inches long, and they have a special connector that isn't pin compatible with ordinary SATA. Before M.2 arrived, it was the standard means to put SSDs in laptops, and many machines have an mSATA slot for this purpose. If your laptop has an unoccupied one then it's a remarkably simple solution to buy an mSATA SSD and install it.

However, it can also be used in a less obvious way, through adapters that allow you to place two mSATA drives in the space taken up by a single 2.5" disk. These can be used in a number of ways, as they include electronics that allows the two mSATA drives to be seen by the system either independently (eSATA) or as one large drive. They can even be RAIDed for greater performance or reliability. But there is another possibility, because you can buy a conventional mSATA hard drive and combine it with an mSATA SSD to get two drives in the space that one normally takes.

The way I've described this, it sounds tempting, but there are numerous reasons why I probably wouldn't go down this path. Your first hurdle is actually finding an mSATA hard drive, because only a few companies made them, and most stopped production some time

A typical SSHD from Seagate



Dual mSATA to SATA RAID



The Western Digital Black² Dual is both an SSD and a conventional hard drive in the same box. But technology like this can be expensive when compared with some of the other options.

“ SDDs are getting cheaper and as they do so the capacities that are affordable are getting bigger ”

ago. The historical nature of these devices also made them relatively small, and the biggest I could locate was the 160GB Toshiba MK1633GSG. At about £60 for one of those, they're also more expensive than an SSD per GB, ironically. If you can ignore those hints, you'll also run into the problem I discussed earlier where the two drives share the bandwidth of one SATA connection, undermining the SSDs speed.

When you factor in the cost of the adapter and the lack of usable space on the hard drive, it's all pretty ridiculous. The only real use for an adapter like this is if you have a couple of mSATA SSDs spare and you'd like to weld them into a single bigger drive that can go inside a laptop with only a 2.5" drive slot. This is a perfect example of why being able to do something doesn't always make it a good idea.

Final Thoughts

The more I've dwelt on this subject, the more I've come to conclude that this is a problem that is in the process of going away. Why? Because SDDs are getting cheaper and as they do so the capacities that are affordable are getting bigger. If you look at the latest Samsung and Crucial drives, they've mostly dispensed with SSDs of less than 250GB, and they have 1TB options. Unless you like to carry your entire Blu-ray collection around with you or some other monstrous file collection, then 1TB is sufficient for most people, and I run an Ultrabook with 250GB of space on it without feeling excessively pinched.

And with most systems now coming with USB 3.0, resorting to an external drive doesn't have the performance penalty that USB 2.0 came with. Talking from experience, if you have a 500GB hard drive and you can afford a 250GB SSD, then it isn't impossible to clean things up to the point where you can transfer to the SSD. And the added bonus of doing a swap is that you get to keep the hard drive in a workable state, which you can pull out and reinstall should the worst happen. If you do insist on upgrading to a dual drive system, combining an SSD and conventional drive, then I'd recommend repurposing the optical drive bay if possible, but with the proviso that you put the hard drive in there and the SSD in the slot it previously occupied.

If you don't do that, you may find that you have an SSD system that is not really much quicker than it previously was with a hard drive. But before you do anything, I'd work out what adding the cost of the optical bay converter to your SSD budget does to the size of the SSD you can afford. Another consideration should be to look at previous solid-state generation designs, because older SSDs can still be blindingly fast. Crucial just

How Do I Transfer My System?

The big question that troubles most laptop owners is how they get their system off their hard drive and onto an SSD, when they can't install the two simultaneously. One method is to remove the internal hard drive and then use a desktop system to clone it to the SSD away from the laptop. However, not everyone has a desktop PC handy or feels technically happy with wiring up drives and installing software to complete this process.

For them, I'd recommend they check out something like the Crucial SSD Install Kit (code CTSSDINSTALLAC), which is designed to smooth the transfer for both laptop and desktop upgraders. For the £18 cost you get a tray that allows a 2.5" drive to fit in one made for a 3.5" desktop disk, two cables and a CD containing Acronis True Image HD data transfer software.

The critical part for laptop owners is the USB-to-SATA cable that allows you to attach an SSD externally, so you can move the contents of the internal hard drive to it. This might take some considerable time over USB 2.0, but once complete you should be able to simply swap the drives over and boot the system back up. You can also retain the kit, for when you decide to get a bigger SSD in the future.



launched a new MX200 series, but you can also still find MX100, M500 and M550 models around that are now much cheaper. Equally, Samsung now has the 850 Series, but the 840 (and 830) are still amazing performers. Because of the older designs still in the channel, probably the best time to buy an SSD is when new products are launched. And as both Samsung and Crucial have just done that, the optimal timing is now. [mm](#)

Scripting Microsoft Office

an introduction

With a little scripting knowledge, you can enhance Microsoft Office in many different ways. **Aaron Birch** shows you how to take your first steps

It's widely known that Microsoft Office is one of the most powerful and flexible office suites available. Its success can be attributed to being a Microsoft app; after all, like Windows, it's often packaged in some form or another with hardware, but this isn't the only reason.

Microsoft Office is perhaps the most fully featured office suite around. It may be one of the most expensive, and free alternatives like OpenOffice may be perfectly fine for most, but in terms of power under the hood, few can hold a candle to Microsoft's productivity tool. A big reason for this lies with scripting.

Advanced users of Microsoft Office can get much more out of the suite than the standard options, tools and even features like point-and-click macros are able to deliver. With some programming or scripting knowledge, you can make Office dance.

The scripting aspect of MS Office is delivered using VBA (Visual Basic for Applications), Microsoft's Visual Basic scripting language that's similar to the full-fledged Visual Basic, and it also supports HTML, DHTML and JavaScript. This is always available in the background, and if you use it, it gives you the ability to do all sorts of things with Office you'd usually be unable to do. You can use scripting to automate tasks, add mathematical fields to documents, auto fill addresses and much more. It's accessed via a similar, if cut-down

interface to Visual Studio. If setup during the install, you can even use the editor to debug web pages.

It's powerful stuff, but it's also complex and tricky to master, not something you can pick up after a while of blind trial and error. So we're going to help, and we're going to cover some basics of scripting as an introduction to this powerful feature of Office.

▼ *VBA is a powerful tool and one that can make Office even more powerful*

Microsoft®
Visual Basic™
for Applications



OLE!

One of the major uses for MS Office scripting is OLE Automation. This is the act of using scripting to automate various tasks, such as saving or converting documents, exporting to other formats, integrating documents with other systems, mail merging and much more. You can also use scripting to create documents that can pull data directly from a database such as SQL or Office's own Access, and you can create interactive forms that can calculate sums, error check, and other tricks that can make using documents easier, both for you and anyone else.

Scripting in this manner is used extensively in corporate environments, and it's also a very popular method of integrating third-party applications and databases, as scripting can help convert data from one program into another format, which can then be passed on. Microsoft defines OLE Automation, now simply called Automation, as a feature that "makes it possible for one application to manipulate objects implemented in another application or to expose objects so they can be manipulated."

Of course, in a home environment, automation and third-party integration isn't all that prominent, but scripting can still be used to perform other tasks, the kind that we may all find useful at some point, and we're going to look at the basics here. Let's cover the basic building blocks of VBScript, as soon as we've covered how to actually access the editor.

Within Office, all you need to do is go into the Developer section of the Ribbon interface and select the

Visual Basic Editor. Alternatively, you can press Alt+F11 to open it up.

If you can't see the Developer tab, you'll have to enable it first. To do this, click File\Options, then go to customise Ribbon. Go into 'Choose commands from' and select Popular Commands. Pick Main tabs from the 'Customise the ribbon' section and select Developer.

Basic VBA Syntax

VBA is an object-based language. This means that various objects are created within the code, and these can revive instructions and act on them. Image them as something ordinary, like a TV remote. The remote is the object, and the input is you pressing the buttons. With this input, the remote can process this command and change the channel, which is the result of the object's action.

Object-based languages are quite common, and VBA is similar to many of them, but like all languages, it has its own way of organising its components and commands, and this is done via a hierarchy system. The object-based system it uses includes classes, objects, properties and methods.

Classes are the definitions or templates for the various objects. A class is created to define the object, which can then be called any number of times and used as needed. Think of a class as the blueprint, as it's used to actually create the class instance object.

Methods are acted on by the code. They can be passed values, the properties of the object can be manipulated, and it can be told to execute all sorts of actions. These actions will usually return a value;

even if it's only a background value controlling something behind the scenes, it's still a value.

A simple example of a brief but very useful line of VBA code is an instruction to tell Word to save. This is done as follows:

Application.ActiveDocument.Save

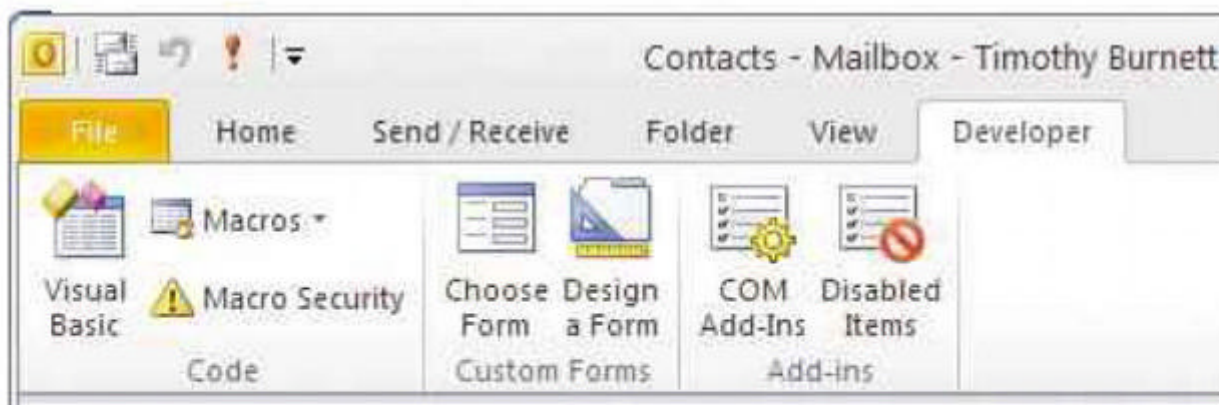
In this example, Application is the object, ActiveDocument is the property, and Save is the method, which is executed and saves the document. It's simple and easy enough to read in a verbose manner, even though VBA primarily focuses on dot syntax. The command can be enhanced with parameters to add more flexibility. These are added in parentheses after the method. In the following example, we use the SaveAs Method to specify the document name:

Applicaton.ActiveDocument.SaveAs("Test Document 1.docx")

You'll also use the same syntax to set values for methods. The code bellow uses the Select method to select cell 'A1', specified by the parameter and to then put in some text, in this case, "Hello World."

**Application.ActiveSheet.Range("A1").Select
Application.Selection.Value = "Hello World"**

Again, as with the previous examples, it's easy enough to read what's going on here, even if you don't understand the language. You can see the first line uses the application object, which in this case is Excel, and specifies the active



< VBA is easy to access, but you may need to enable the Developer tab first

spreadsheet. It looks for the specified range, which is cell A1 and selects it. The next line tells Excel to take the selected cell from the previous line and to set its value to "Hello World."

It's fairly simple at this level, and it's not difficult to see what's happening, even if you're still learning to code. VBA makes things much easier as it uses an autocomplete feature that suggests code, so you can easily browse through lists of commands, learning things as you go.

Subs And Macros

So how exactly does the code you put into VBA hold together, and how does Office use it? A good example of code use lies with macros, pre-recorded actions that can be executed automatically. Many of you will have no doubt used macros, but have you ever seen the code behind them? It's easy to see this, but first let's make a new macro.

Open up Excel and a new workbook, then open the Developer tab. Click on the option to record a new macro and stick with the default settings. Call the macro whatever you like, and click OK to begin recording.

Click in a cell of the worksheet, A1 is fine, and enter some text, such as your name or 'Hello World' if you like, then click into another cell. Once you've done this, click the stop button to finish recording the macro.

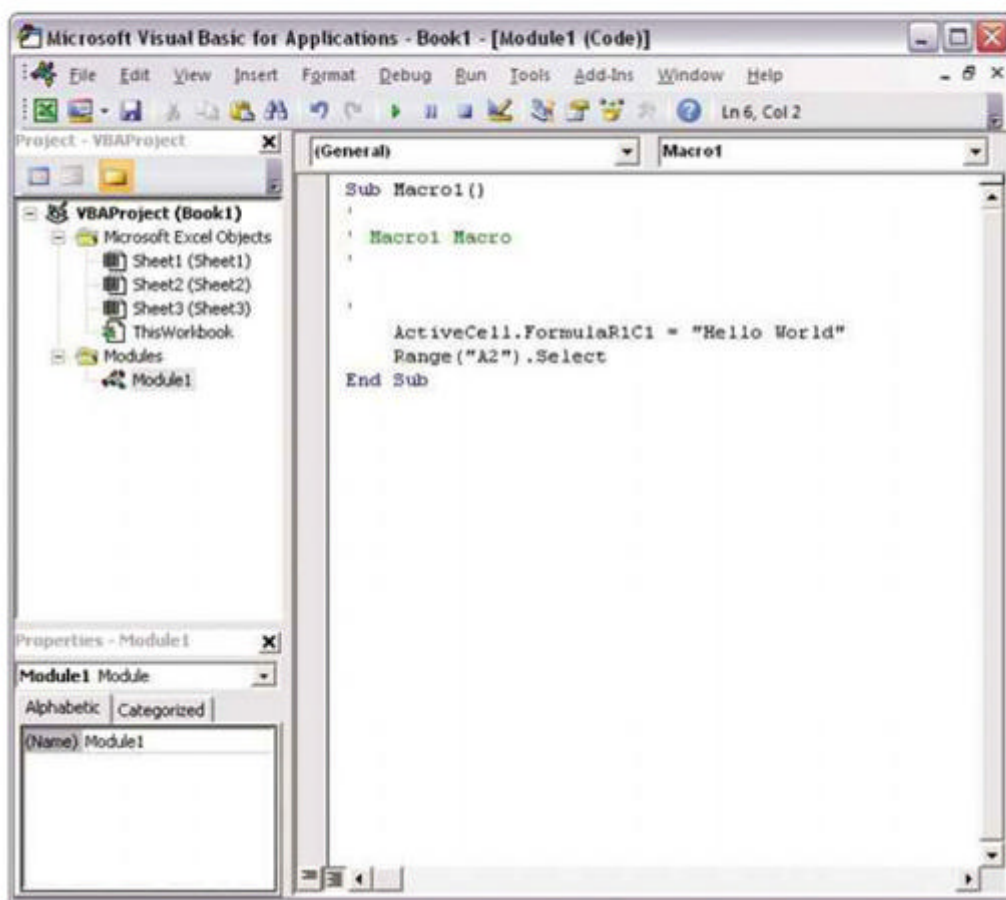
Click the Macros button on the Developer tab and select the macro you just created, and then select Edit. The VBA editor will open up and you'll see your code.

Sub YourMacro()

```
' YourMacro Macro
```

```
    Range("A1").Select
    ActiveCell.FormulaR1C1 =
    "Hello World"
    Range("A2").Select
End Sub
```

You'll notice that the code begins with the word Sub. This is short for subroutine and is the beginning of the macro code, followed by the name of your macro.



Below this you'll see the actual code that tells Excel what to do when the macro is run. For our example, you'll see the first range select line that selects the cell to enter text into (A1), then the line ActiveCell.FormulaR1C1, which tells Excel to enter the text you typed in when recording, and the next line is the instruction to select the second cell you clicked after entering the text (here it's A2). This is followed by 'End Sub,' which finalises the macro command.

It's a very simple example and isn't even a scratch on the surface of what's possible here, but it's a good place to start, and if you're learning how to code, this is an excellent way to do so on your own. Simply record a macro doing what you'd like to automate or the kinds of things you'd like to try and then examine the code after. It'll give you a good idea of how the code hangs together, and from there you'll have a much better understanding.

From this point and using the built-in developer help, which is very useful, you'll be able to build

▲ VBA's interface is simple enough, and the language is one of the easier to learn

up code to test. To do this within VBA, click the play button in the toolbar. This will, if all goes well, execute your code. However, if something is wrong, you'll need to fix it first.

Bug Stomping

Debugging code is a major task for any programmer, and little code is written that doesn't need some form of debugging. For this reason VBA features debugging tools to help you. These range from error messages that tell you what's going on, to highlights and the ability to stop code as it executes, so you can step through it, line by line to find the problem. You can also add watches to various parts of the code, such as values.

Thus, when you run your code, you may see an error pop up, sometimes referring to a specific line in the code to help you find the problem. This error will let you end the code, or you can click the Debug button try and fix the problem there

and then, and VBA should show you where it stopped.

Common problems are the most basic issues, such as typos, not closing quotes or not using the right kinds of value in variables (which we'll come to next). So before you spend hours and hours trying to recode something that doesn't work, always check the basics, because it can save you a lot of time.

Vary Vary Useful

VBA, like most scripting languages, makes use of variables in its code. These are aspects of the code that you create to hold a value, which will be used throughout the code, and can also be changed as needed. They're an essential building block to advanced coding and are the cornerstone of tidy, reusable code.

Variables are set up in VBA by using the Dim statement, usually at the beginning of the code, but they can also be set within separate handlers and sections of the code. However, for a variable to be seen throughout the code, it's best to set it at the start. Here's a simple example of setting a text variable, also known as a 'string':

Dim NewVariable As String NewVariable = "Test Text"

And that's it. The above code creates a string variable and sets its value as "New Text." This variable can then be called on at any time and used in whatever way you need. For example, if you wanted to change the text of a cell in Excel to the value you specified, you'd do the following:

Worksheets(1).Range("B1").Value = NewVariable.

This would set the text of cell B1 to "Test Text" as that's the value of the variable we set up. You can also change the value of a variable at any time by simply setting its value again.

So if you wanted to change the value of NewVariable later one, you'd simply type 'NewVariable = "Whatever text you want." ' You can also clear the variable by entering 'NewVariable = "" ' to set it to nothing.

The same applies with other types of variable, which includes integer (whole number). You just need to make sure you set the type of variable correctly, otherwise you'll create errors. For example, let's say you wanted to set the value of the variable we created, NewVariable, to 10. Entering 'NewVariable = 10' would kick up an error, as you've entered an integer value, not a text one, which is the wrong type for the variable.

Thus you'd need to create a new variable to hold the integer value:

Dim NewVariable2 As Integer NewVariable2 = 10

Ifs And Loop De Loops

Along with variables, two other essential elements of any program are branching statements and loops. These are used to do all sorts of things and are a major component of automaton, not to mention programming as a whole.

A simple branching statement is a basic 'if' statement. This takes an argument and then does something depending on the outcome. VBA uses these statements, and they're very useful. Here's a simple example.

Sub NewMacro1()

```
If Worksheets(1).Range("B1").
value = "Ordered" Then
    Dim i as Integer
    For i = 2 to 10
        Worksheets(1).
Range("B" & i).value = "To be
sent"
    Next i
Else
    MsgBox "Not ordered!"
End If
End Sub
```

In this code we check the value of cell B1, and if it's "Ordered" we move to the next step. Here we set a new integer variable called i (a common programmer practice in VBA and other languages), and then we enter a simple loop, the other part of our flexible toolset. We set the loop to begin with the value of 2 and carry on until it reaches 10. In each step we tell Excel to enter the text "To be sent" in the specified cell, which is done by setting the

column letter and combining it with our integer variable. Therefore, in the first step it would be "A" & i, which would give us cell A2.

The next line, 'Next i', simply increments the value of i, so it would increase to 3, then 4 and so on until it reaches 10. Once the loop reaches 10, it exits the if statement and is done.

The next part of the code Else, and the code will skip to here if the argument we started with isn't true. So if the value of cell B1 isn't "Ordered", it will end up here and will display a box that says "Not Ordered!"

We should also mention that our use of the variable 'i' is a temporary variable. As it's created and used within the if loop, this instance of the variable isn't seen anywhere else. Variables can be contained in this and other ways, hence our advice of setting variables at the start of your code if you need them to be globally visible and accessible.

This code snippet is a very simple example, and the branching statement, along with loops, is one of the most powerful and integral aspects of any programmer's arsenal. You should spend time getting familiar with these.

Eventually, as you become more proficient, you'll move on to even more powerful and effective methods, such as using case statements and nested branching statements, but as with all things, the key here is to learn to walk before you can run. Programming, be it as advanced as C++ or as accessible as VBA is always daunting until you have experience, and trying to do too much, too early is the quickest road to failure. Start small, learn the basics and then move on, never being afraid to use help documentation and coding websites. Even professional programmers use help and websites, so never be afraid to seek some assistance. And remember:

```
If AtFirstYouDon'tSucceed =
"true" Then
    MsgBox "Try Again!"
Else
    MsgBox "You're a
natural"
End if
```

mm



PLAY-BY-WIRE

Has home streaming of games finally come of age?
Ian McGurren finds out

Game streaming isn't a new idea. It has popped up in fits and starts since 2000, but even the big names in the field, OnLive being possibly the most well known, had struggled to make any real impact. Part of this can be attributed to confusion over what it actually is, and essentially 'believing' it's possible. But times are changing, technology is becoming exponentially more powerful and, importantly, cheaper too, meaning streaming games isn't

just an idea, it's a reality, and arguably it's the future.

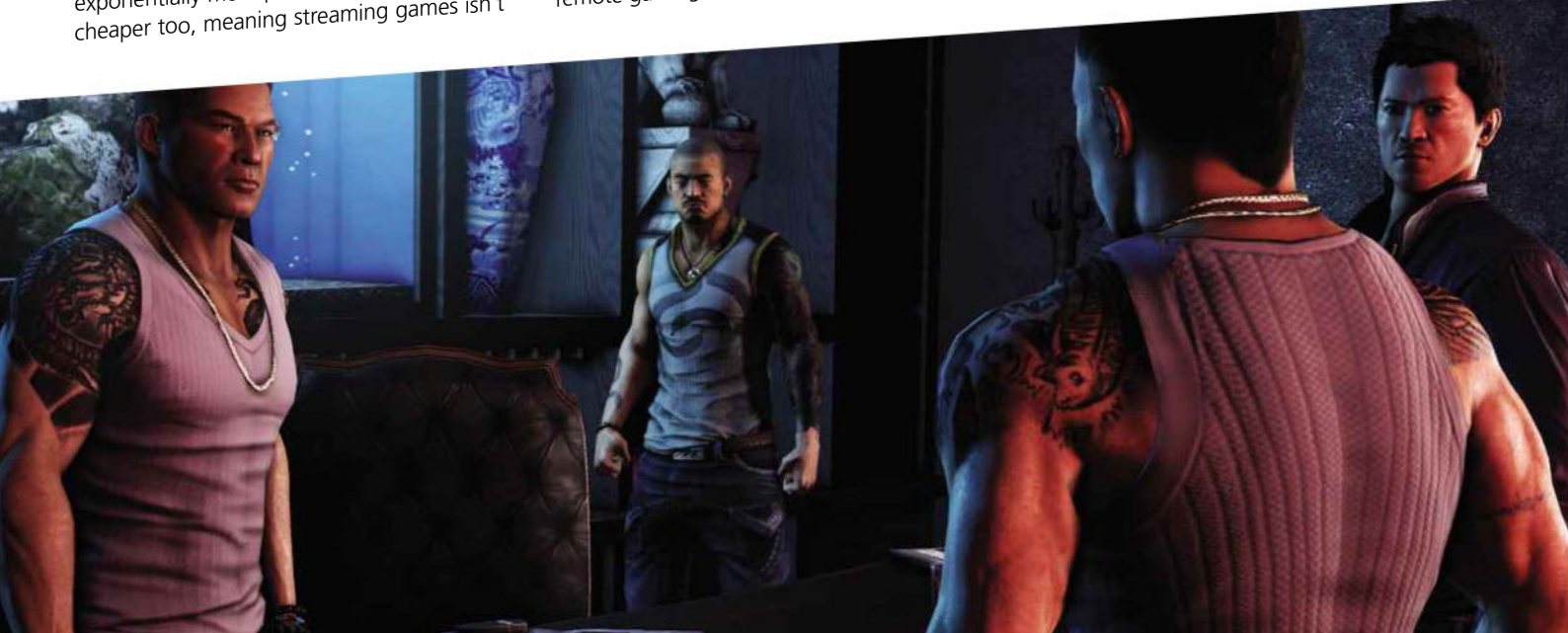
What Is Game Streaming?

Game streaming or, in its first stage of life, cloud gaming, is based on the idea that you can essentially play a game on a remote computer by only viewing a video stream of the output (usually encoded in h264 or similar). With all the heavy GPU lifting done on the remote gaming server, the device you use to

interact with it needs only to be able to decode a video stream and to send control data. In theory, you could rent a triple-headed Nvidia GTX980 system in a server farm somewhere and stream games to your home on a device capable of talking to the stream it puts out.

Things have begun to move on, as the march of innovation never stops, and where cloud gamers would have previously had their games pumped from a server farm, it's now possible to build and run the game server yourself. In fact, you may already have much of what you need.

There are two major names in in-home game streaming at present: Nvidia and Valve. Both their solutions are PC based and require only a rudimentary knowledge of networking to set up. But in the case of Nvidia's solution, it can be costly due to the requirement for proprietary hardware.



Nvidia GameStream

First announced with the release of 2013's Shield controller / tablet hybrid (that's Nvidia's capitalisation, not mine), GameStream is precisely what it says it is, a solution for the streaming of games. Unlike OnLive however, the streaming is done from the user's own gaming PC, and can be streamed to anywhere in the home, even over the internet. This means a GameStream user could theoretically play their games anywhere on the planet that there is an internet connection. Whether this is true in practice, we will find out later.

Building A GameStream Box

Not surprisingly, the requirements for Nvidia's proprietary streaming solution include having an Nvidia graphics card – and a GTX one at that. Those of you with GT-branded HTPC cards will need to look elsewhere. The minimum is currently a GTX650, but be aware that not only is it needed to do the streaming, it still has to perform its regular GPU functions. Therefore many newer games will not perform quite as well with a card that was barely mid-range in 2013. For around £100, the excellent GTX750ti can be picked up, and this should really be considered a minimum at present. Laptop-wise, GTX700m and some 600m chipsets will work. For the testing, we went with a budget build that will roughly match the current generation consoles, such as the PS4 and Xbox One, for the same price. Don't forget to factor in the Shield tablet, though.

The GameStream server build:

Nvidia 2GB GTX 750ti – £109
Intel Pentium G3528 – £40
4GB DDR3 1600MHz RAM – £25
1tb Western Digital SSHD – £59
MSI H81M-P33 motherboard – £33
Antec VSK3000 case – £25
BeQuiet L8 350W PSU – £40
PC total: £331

The Weak Spot

This can't be emphasised enough: all streaming setups live and die by their networking. If you want the optimal experience, you have to go with a fully wired gigabit connection to the server. You can try going the whole hog and installing a second NIC for a direct connection, especially if your network is 100Mbit but buried under carpets or in a wall. Next best is Wireless N, but if you still have a 100Mbit network, this will ultimately be your bottleneck. Using 100Mbit is possible: just drop the stream quality to 720p with lower detail. Anything below this, however, especially Wireless G, will suffer.

Nvidia Shield Tablet LTE – £299 (or grab the wi-fi only version for £239)
Nvidia Shield controller – £40

Shield total: LTE £339 / wi-fi: £279
Grand total: LTE £670 / wi-fi: £610

Setting Up

Our GameStream server is a pretty straightforward build. It runs Windows 7, and because we've opted to take advantage of the great prices and the convenience of digital downloads, it uses Steam for its main game repository. Installing the latest Nvidia drivers also installs the GameStream suite, and this can be pointed at Steam for convenience or directly at your installed games if you don't use Steam. The latter also applies to non-Steam services, so anything on Origin or uPlay will need to be individually added to GameStream in order for it to see them.

That's pretty much it. All the games on the host machine are run at least once before using them via GameStream, as many require patches or additional redistributables. Then, once the server is running, it's merely a case of marrying the Shield tablet's GameStream app to the GameStream PC and waiting for your preinstalled games to begin to show up on the tablet.

In Practice

Choosing, launching and exiting games is all very simple via the GameStream app's interface, meaning ducking in and out of different games is a breeze. Those that don't appear in the GameStream list can also be attempted by running Steam itself from GameStream, which will automatically launch it in Big Picture mode. There may be the odd occasion,

Into The Limelight

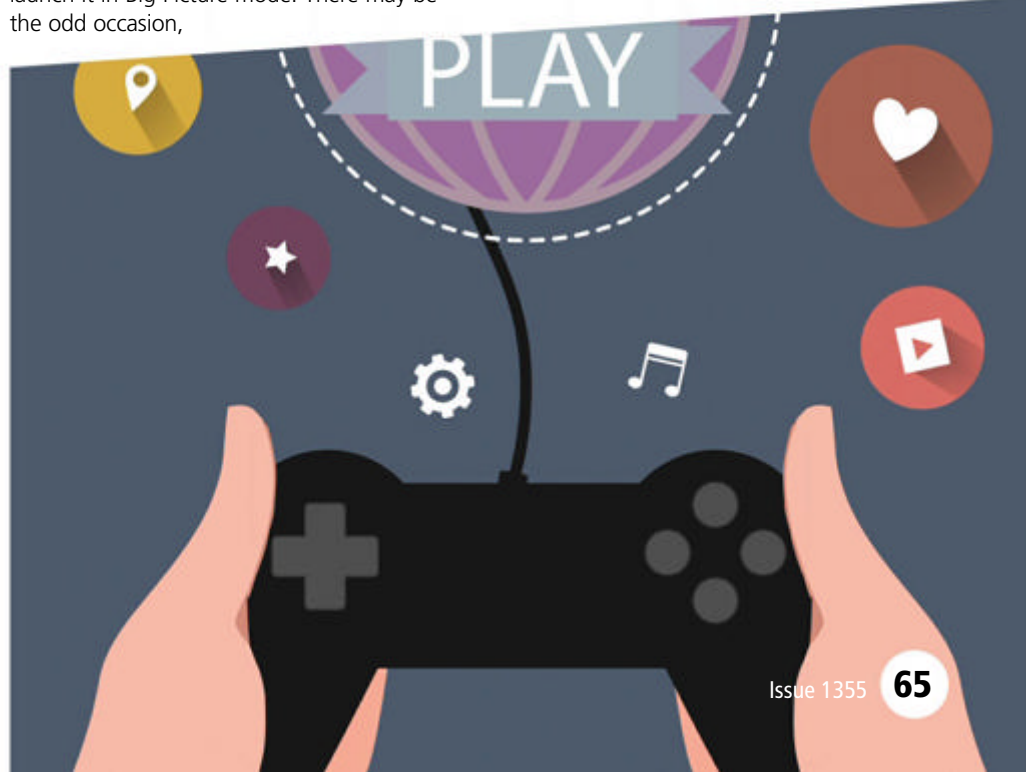
Limelight is an open-source alternative to GameStream and in some cases works better than Nvidia's own solution. It not only has clients for Android but also for PC, Mac and Linux too, though in various stages of completeness. There's even a mooted iOS client too. The interface isn't quite as nice, but Limelight is worth a go at least, especially as it's free and streams have more configuration options.

however, when something won't exit cleanly, requiring remotely accessing the server in order to kill the process.

A true test of streaming is fast changing visuals, and racing games such as *Burnout Paradise* and even *Need for Speed: The Rivals* flew along at blistering pace, easily reaching 30fps, though 60fps wasn't quite there. The lack of lag was enough to play the game effectively too – no drunken delayed feeling here. Comparatively slower paced games, such as first-person shooters, performed just as well, with the GameStream stream keeping up with the 50+ frame-rate the GTX 750ti was pumping out when playing *Bioshock Infinite*. When the frame-rates did suffer, it was often down to the server, not the stream. *Crysis 3*, for example, will tax pretty much any single-card solution, so around 30fps with reduced detail and AA on the 750ti was easy for the stream to take.

Problems

This is under optimal conditions, though, and how well it works and how successful streaming games is heavily depends on a





“ Streaming games isn't just an idea, it's a reality, and arguably it's the future ”

great many factors, the most important of all being network speed. If you want your performance to match that as just described, you'll need an unwavering, fast network connection, either by using Wireless N wi-fi or with a wired Ethernet connection, on the same network as your server. The latter is optimal but it severely curtails the portability of the Shield tablet. The former is better, but not everybody has N-band routers (hello, Sky...).

Without one of these solutions, the quality of the stream begins to fall away quicker. GameStream requires a minimum of 10Mbps from the server to the PC and 2Mbps the other way for control and such. But that is a minimum, and while Wireless G technically works, expect to have to curtail the quality of your stream, possibly to the point it begins to look like an early PS3 game. At this point stutters will also start to crop up, as well as controller lag, pretty much writing off its use for racers and twitch shooters.

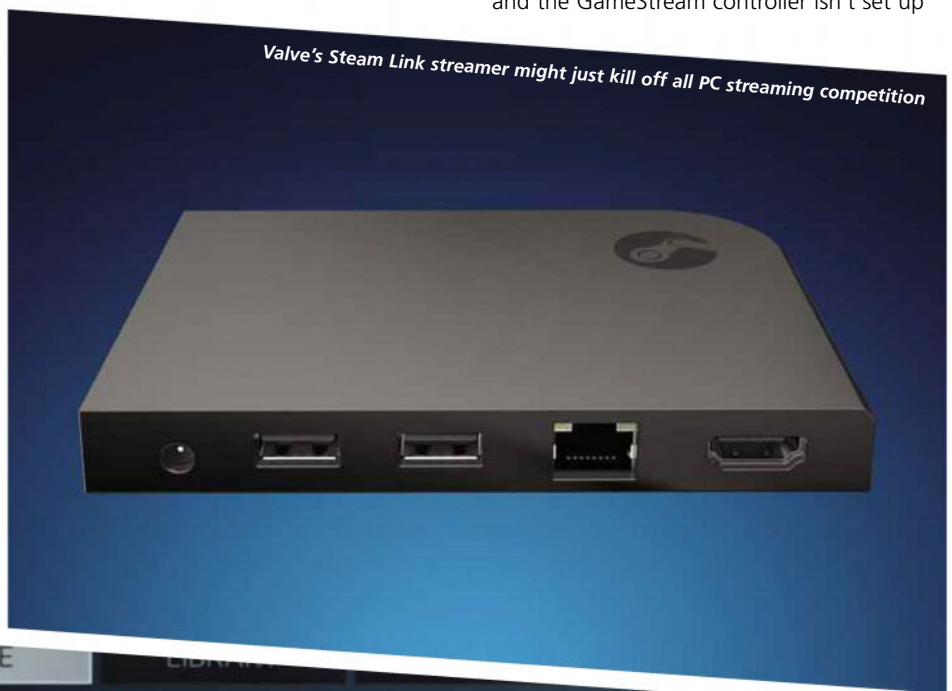
Remote use was very hit and miss, often requiring a slew of ports to be forwarded on the host and remote routers in order to work. In itself, that's quite an undertaking, but in some instances, you'll simply be blocked from doing this (in a hotel, for example). LTE performance could

be passable in a good 4G area where there was the bandwidth. Ping did suffer, though, meaning in both of these instances, twitch gaming was again out. Slow paced games could work, but some of these, such as RTS games, didn't lend themselves to a smaller screen. As a proof of concept, it does just that, but for now, there are too many factors against using GameStream remotely over the web for it to be a selling point –

this could explain why Nvidia still designates this as a beta function.

There are also issues with games not yet supported by GameStream fully. In practice, most do work when running, but some still expect keyboard input. Ridge Racer Unbounded, for example, runs like a dream, but it initially pops up with a display options dialogue box on launch, something the Shield controller can sort-of handle with its built-in trackpad, but other controllers wouldn't work. It can often be overcome by adding launch flags to an .exe, but that's confusing, and hit and miss. To be fair to GameStream, though, this is kind of an over-and-above support situation; it only claims to support a relatively small number of games.

However, even supported games have problems, often around anti-piracy measures or proprietary web clients. GTA IV, for example, requires signing into Games for Windows Live every time it is launched, and the GameStream controller isn't set up



Valve's Steam Link streamer might just kill off all PC streaming competition

Big Picture really ties the whole Steam experience together

Counter Strike: Global Offensive

Sleeping Dogs

Skyrim

New DLC Available

\$49.99

for this kind of interaction. PCs are getting better at 'the console experience', but there are still quirks that even GameStream can't plaster over.

Lastly there are a couple of notable points. Firstly, while it's serving games, that machine is doing just that and cannot be used for anything else. So put out of your mind the idea you can stream games while someone else views video or browses the web on the same machine. Secondly, Remote Desktop breaks GameStream; as soon as you terminate your RDP session, the machine locks itself. This stops the server being visible to the tablet. Solution: use something like Splashtop, Teamviewer or VNC or alternatively, pull out your hair and scream. A lot.

The Verdict

The proof is in the pudding, and GameStream is a very capable pudding indeed. This opens up a world of games, in high quality and often at a far friendlier price. With the system above, you can be playing AAA titles from your server, anywhere in the house. Make use of the HDMI out on the Shield itself, and you can effectively have a great Android tablet that doubles up as a console-type experience for a second room.

But this is only when all the ingredients are just so, and as soon as one drops away, the whole experience drops away with it. Above all else, key to this is network speed, either Wireless N or wired gigabit Ethernet. The latter will compromise mobility but if you're hooking it up to a TV, it matters not. Remote use is even more of a gamble, though it is one that will improve as our internet infrastructure improves over time. Then there's the rough edges of PC gaming with a controller, something still not quite there, especially on the front end.

Here's the bottom line with GameStream: it does work. When it's running at its best, when lag isn't an issue and both the frame-rate and resolution are more or less spot on, GameStream is exactly what it claims to be. You can be using the Shield controller to play games streamed from your server to your Shield tablet, and it's 90% like the real thing (the 720p video stream loses that extra fidelity and colour depth that the real thing has). If you don't have this optimal setup, though – and it's likely you don't – it becomes a game of compromises that may not be worth the outlay.

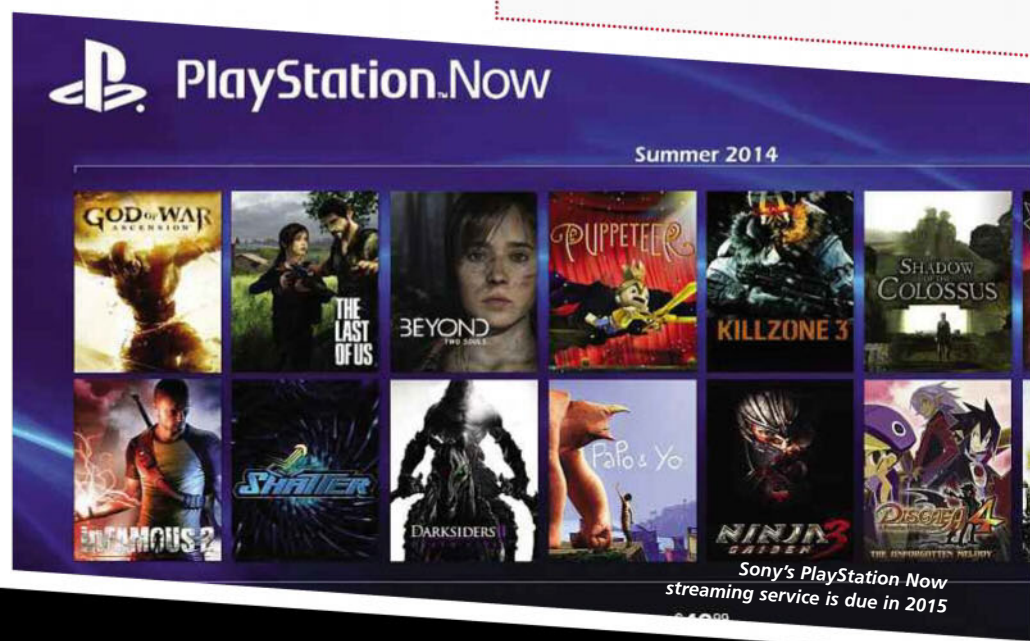
Steam In-Home Streaming

If you're sure that you don't want to roam around with your streaming games and would rather opt for being able to play them in another room, then Steam In-Home Streaming (SIHS) might be more to your tastes. Originally added to the Steam client in early 2014 as a beta feature (technically it still is), SIHS uses the same kind of games streaming methodology as Nvidia's solution

– game rendered to video downstream, controller data upstream. The difference here is that it is platform agnostic, so PCs, Macs and even Linux machines can get in on the fun, and you don't even

Full SteamOS Ahead

You may have seen talk of Valve having its own operating system. Well, it does and it's SteamOS, though to call it its own is a little wide of the mark. SteamOS is a Linux distro based on Debian, available free from Valve itself. Once installed, the built-in Steam client gives access to all the Linux versions of your Steam library. While this is growing, it's not huge. More notable is that it can also work as a Steam In-Home Streaming client, as long as there are drivers for your GPU that support hardware decoding. It's a great way round having to shell out for another Windows licence if all you need is to stream.



The GameStream Android client UI is simple and clean

SHOP

NEWS

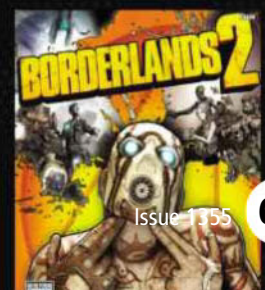
MY ANDROID GAMES

MY PC GAMES

☰ MY PC GAMES

NVIDIA 1 10909 ●

NVRAZER ●



SteamOS

STEAM™

A clever little box of Brix



need to have a specific make of GPU. SIHS also makes good use of Steam's Big Picture feature, an interface designed for traditional joypad controllers that gives a pretty good approximation of a console-type experience.

Unlike GameStream, here your server is not restricted to a specific Nvidia GPU, as AMD, lower-end Nvidia and even on-board graphics can all be used. The same caveat applies, though: the overall quality is still dictated by what comes from the game server, so don't expect *Far Cry 4* to suddenly start to work with an Intel HD5000 on-board GPU.

The bigger change, however, is that of the client requirements. SIHS doesn't require a specific chipset like GameStream does, meaning you can stream to pretty much any computer that can decode the stream fast enough. For machines with discrete GPUs, there's every chance they can handle high bit-rate 1080p video. Even laptops made in the last three years may have a good crack at it, though they might require on-board graphics that include a hardware HD decoder. It also means you can build your own SIHS client for cheap, plug in a joypad, hook it up to the TV and you have yourself a Steam streamer.

Building A Tiny SIHS Client

With the advances in technology in recent year and the comparatively low requirements for a SIHS client, it's possible to make a client that will sit in the palm of your hand. Mini-ITX was previously the smallest form factor a discrete little machine could be made up of, but since Intel's introduction of its Next Unit of Computing (NUC) range, there has been a slew of these Haswell and Bay Trail-M powered tiny boxes released. For our client, we've gone for a basic Gigabyte Brix model, powered by the Bay Trail-M N2807 CPU. This is notable for having Intel's QuickSync hardware HD decoder built in, so make sure if you go the NUC route, it has QuickSync. There's also the choice between Valve's Linux

build, SteamOS, free and ideal if the client will only serve up games, or budget for Windows if you want to also run applications like Plex, Netflix and BBC iPlayer.

The NUC Steam client build:

Gigabyte BxBT-2807 – £85
4GB DDR3L 1.35v SODIMM – £27
OCZ ARC 100 SSD 120GB – £45
SteamOS – £0 / **Windows 7** – £40
Xbox 360 wireless joypad for Windows – £30

Total: SteamOS – £187 / **Windows 7** – £227

In Practice

Opting for the Windows 7 build, as we wanted the flexibility to also consume media on it, the build was as simple as any other PC build. All the components dropped into place easily, and the USB 3.0 port on the front meant Windows 7 installed rapidly. Once up and running, with all drivers installed, it was simply a case of installing the Steam client and signing in. Making sure that SIHS had been enabled on the games server, the notification that we were connected to the streaming server, and the option to stream a game instead of installing it meant the system was a go. Hooking up an Xbox 360 joypad – the PC joypad of choice for most joypad-enable games – and firing up Steam Big Picture presented us with the friendly way to navigate our Steam library. Launching a game was as simple as selecting it to run, and on exiting the game, we were returned once again to the Big Picture interface.

Initially our client was set up on a 100Mbit network, which was unable to support a full 1080p, high-quality stream, though 720p, lower-quality settings would happily play racers at 40-60fps with snappy controller response. Bumping the networking up to gigabit, however, fully unleashed the possibilities, with full 60fps, high-quality 1080p streams being handled with ease by the Brix. Racers breezed by, shooters could handle twitch responses as required and they looked every bit as good as the host GPU would allow. This alone puts SIHS technically above Nvidia GameStream, though it loses the flexibility of being mobile. Such is the quality at its best setting, however, the stream is practically indistinguishable from the real deal on a 40" screen at an average viewing distance of around 8ft.

Problems

Many of the problems encountered with SIHS are the same as those encountered with GameStream – games launching with dialogue boxes, games not exiting correctly, poor network performance hampering the overall experience, games not supporting joypad input, the host machine being in use

“ When it's running at its best, when lag isn't an issue and both the frame-rate and resolution are more or less spot on, GameStream is exactly what it claims to be ”

Shield Revealed

Keeping Nvidia's Marvel naming, its Shield devices are the company's streaming-enabled Android devices. Starting with the interesting Shield, a controller with a tablet attached, there is also the Advent Tegra Note 7 (often found for under £60 used) and the powerhouse Shield Tablet and controller. All, plus the forthcoming 4K Shield console, are the only GameStream clients, available at present, as well as being the only devices able to access Nvidia's online PC game streaming service, GRID.



The Shield Tablet is a killer tablet as well as a GameStream client

when streaming. In addition, SIHS isn't so happy launching and exiting from non-Steam games, such as those locally installed from DVD or those that use uPlay or Origin. Some, like *Need for Speed: The Rivals*, work fine. Others, like *Need for Speed: The Run*, work with a joy pad in-game, but sometimes need a keyboard input in menus. It's worth having a Bluetooth keyboard paired to the client just for these occasions, but it does break the console experience that Big Picture offers.

The Verdict

If you want a game streaming solution for another room in your home and you've bought into Steam for your games, then SIHS is probably the best solution for you at this moment in time, especially if you have some spare parts that you can call on to make a client for little outlay. Like GameStream, it's a slave to network speed, so try to make sure that the connection between the server and the client is as fast as you can get it, ideally gigabit. The compromise here with lower bandwidth is less evident than with GameStream, with lower quality replacing streaming fits and starts. Bottom line: if you're a Steam user wanting a second-room solution, then SIHS is the one for you.

Game Streaming – The Verdict

The streaming of games was once a strange idea at odds with the progression of home hardware. When OnLive was first launched, people balked at the idea of using just a small 'receiver' device and streaming it from a central server miles away. At that time it was

fair to be sceptical, given high-speed fibre broadband services like BT Infinity had only just started to appear in homes. But as the technology has moved on, and now big name players are backing the technology, many more users are starting to believe in the possibilities it offers.

GameStream and Steam In-Home Streaming are very good examples of the technology, and under ideal conditions, they live up to their promise. The idea of hosting a noisy gaming server tucked away in the loft and streaming from it to clients in the lounge, bedroom or even a tablet is not only no longer a far-fetched dream, it is becoming a considered option for many. If Sony is specifically marketing its PS Vita TV unit as a PlayStation 4 streaming client first and a console second, and Microsoft's Windows 10 will offer Xbox One streaming, you know it will be in the public consciousness before long, like a gaming equivalent of the second Sky box for the bedroom. There's even the strong possibility that the next generation of consoles will take advantage of then-mature streaming solutions and offer this as the norm, and that the PS4, Wii U and Xbox One may be the last of their type. The ninth-generation consoles could be mere streaming boxes for 'Netflix of games'-style services in the same mould as Nvidia's GRID. After all, the cost of far more basic hardware and a lack of physical software would be very appealing to those tech giants currently not so flush with cash.

It isn't all future cool, though, as any network streaming service is only as good

The Missing Link?

If you're patient and don't mind waiting until the end of the year, Valve itself is releasing a Steam In-Home Streaming client. Stylistically, it's not unlike Amazon's Fire TV media player-cum-console. Here, though, it's all about the games, with the Steam Link performing much the same function as our SIHS client, with full 1080p output. Not much is known about the Link yet, other than it requires a wired connection, will likely run some form of embedded SteamOS and – this is the clincher – it'll be launched at \$49.99. A UK release is as yet unknown.

as the network it's on, and we're only just at the point where they work effectively in-home. Even then, 1080p / 60fps is the upper limit, and already PC gaming is pushing past this with the likes of 4K and adaptive sync. The underlying technology may well want to push ahead into the future, but it'll always have to wait for networking to catch up, especially in the mobile arena.

But now, in 2015, if you have the hardware or can handle the compromises, then the technology is there for you to do it, and when it works, it's superb and more or less delivers on the promise. For our money, Steam In-Home Streaming with Big Picture is the better solution; it's higher quality, platform agnostic and is often cheaper to dip your toes into. With Steam Link already announced, were Valve to also release a client for mobile devices, it may well be game over for any competition. However, from this we may get a standard that the industry can adopt and move forward with. Exciting times are ahead, and the stream may soon become a flood. [mm](#)

“ The PS4, Wii U and Xbox One may be the last of their type, and the ninth-generation consoles will be merely streaming boxes for ‘Netflix of games’-style services ”



Food And Drink Apps For Android

Ensure you only put the best in your mouth
with **Keir Thomas's** guide to apps designed to
get the best from eating and drinking

For such a universally required skill it can be surprising how few of us know how to cook or even mix drinks. High-street eateries are keen to exploit this, of course, but below we take a look at apps that cater (if you'll pardon the pun) to all methods of food enjoyment – whether that's visiting a burger bar, staying at home and rustling up something decent or even perfecting a Martini.

As usual, all the apps are available in the Google Play store and all are free of charge. They were tested on Android Jelly Bean 4.3.

MSN Food & Drink

A resurgent Microsoft isn't the lame duck that it once was, as apps like this demonstrate. Developed initially for Microsoft platforms, including Windows 8, finding it on Android has to be considered a marvel. Microsoft's largesse in supporting non-Windows platforms really does indicate the company is heading in a very different – and healthy – strategic direction, and you'll also find this app available for Apple iOS.

“ It seems everybody nowadays wants to comment on what goes into their mouth ”

So what do you get with this app? Put simply, at its heart are lots and lots of recipes, for all kinds of cuisines and with the ability to filter to match your requirements (by dietary requirement, such as vegan or by style). MSN says the recipes are drawn from Allrecipes.com, The Food Network, BigOven, Conde Nast publications, Epicurious, Bon Appetit and more. Additionally, recipes and notes are provided by 'famous chefs'. Within the app itself, tapping the Chefs heading shows a list of names that unsophisticated eyes didn't recognise, but in each case a bio of the chef is provided, along with a selection of recipes and a More tab that lets you watch movies – perhaps cookery demonstrations or simply tours of the individual's establishments.

When the app starts, you're immediately told of a version for UK users and asked if you'd like to switch. We did so but noticed that many recipes were still based on the US system of cup measures. However, most experienced cooks take such things in their stride, and this was by no means a widespread affliction.

You can sign in with your Microsoft account if you wish, in order to sync favourite recipes among your devices, but this isn't pushed on you and you'll have to open the Settings menu to find it. A more obvious and welcome feature is the ability to add to a virtual shopping list all the ingredients for the recipe you're currently looking at. This is done by simply tapping the button at the top right. A little more intelligence would be welcome

here – there's little point in adding 'Salt & pepper' to the list, for example – and when viewing the list (presumably when in Sainsbury's) you have to tap each of recipe you've added individually in order to view the ingredients. They can't be combined into one list. However, items can be rearranged, which can be helpful if you like to arrange a shopping list by the location of items as you walk up and down the aisles.

The Cooking School tab presents a list of videos showing basic techniques – everything from how to use a chef's knife to creating mayonnaise. Once again a nice touch is how cosmopolitan the app is – you're as likely to find ways of cooking rice for Indian meals as you are for preparing Hollandaise sauce.

For fans of booze there's also a cocktails section, as well as a wine section that can only be described as encyclopaedic.

Put simply, this is a terrific app that's hard to fault and packed full of useful stuff. We couldn't quite believe it was free and kept waiting for an upgrade box to pop up.

Wriggle

A persistent belief of app developers is that people just love to visit new restaurants. There are app categories predicated on this idea, backed by millions of dollars of investment. The reality for most of us is that we tend to stick to restaurants we know, but Wriggle is yet another app that aims to broaden our culinary horizons. This time the app is built around time-limited discounts for various

“ A persistent belief of app developers is that people just love to visit new restaurants ”

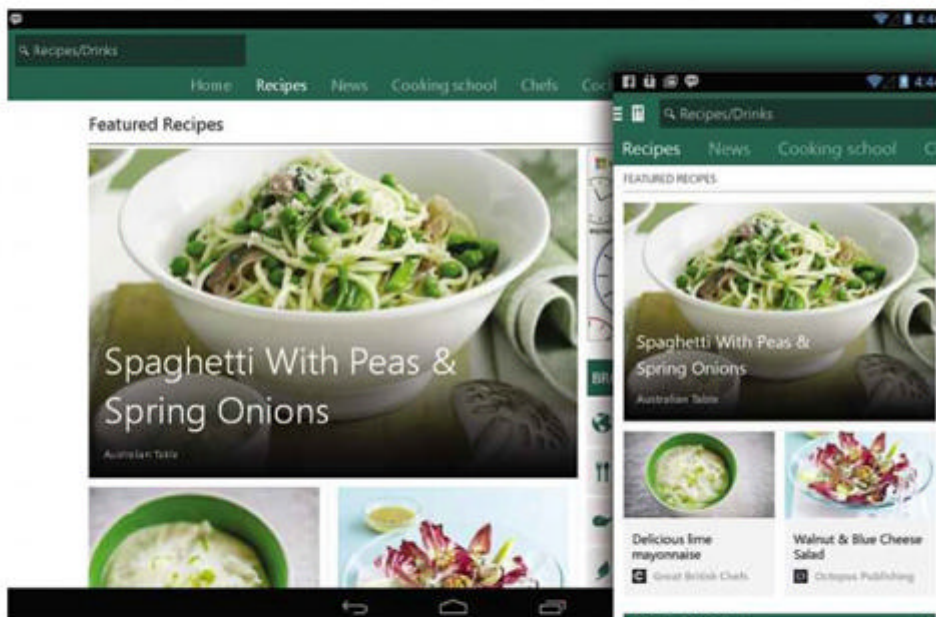
independent eateries and, right now, those places are only in London and Bristol. However, we have to assume the folks behind the app aim to expand as soon as humanly possible.

The process of using the app is simple. Dishes available in various establishments are shown in a list, complete with a good-quality photo, and you can scroll through them by dragging up and down (the app treats a tablet like a large phone). Inset against each entry is the price you'll pay, showing the discount over the usual cost and a countdown timer. Tapping the entry in the list explains what you'll get, details of the establishment and a brief 'Why we love' review presumably written by Wriggle staffers – a nice touch. If there are any conditions for the offer, these are also shown, and here we got just a little confused, unsure whether we had to redeem the offer within the timeframe – that is, whether we had to call in to the restaurant within the one hour 32 minutes shown as remaining for that discounted burger – or whether the timeframe applied only to purchasing the offer. We suspect it's the latter, which means that unless you're within the locality of an establishment, any offer with less than an hour left is useless –

you'd have to get there and claim the offer in that time. And would you need to have finished eating within the time period too? It's just not clear.

Some offers eschew countdowns in favour of time periods during which the offer runs – 6.30-7.30pm, for example, or 7pm-11pm. Thus it's possible to book an evening meal during the daytime.

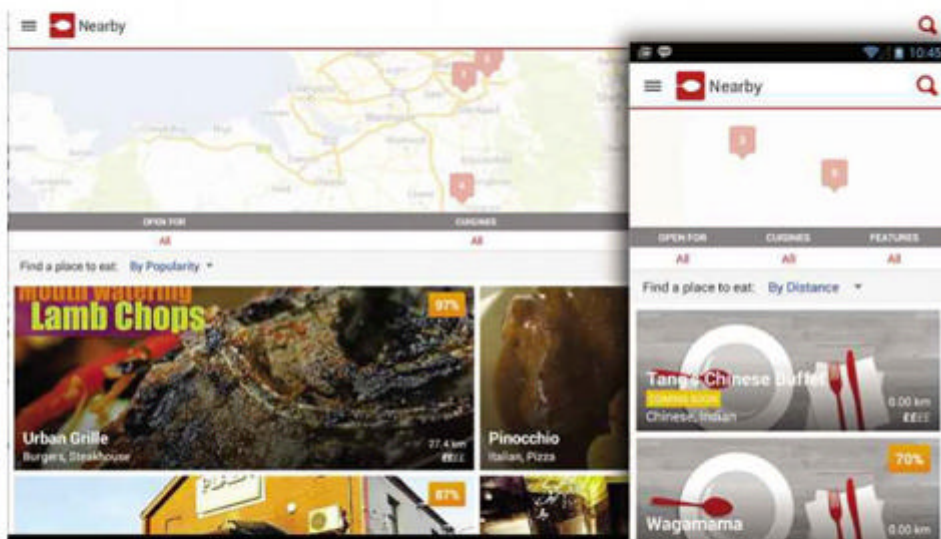
The genius of Wriggle is that it demands up-front payment via debit or credit card. We guess this avoids people booking and not turning up, but this highlights another problem: you aren't booking a table via Wriggle. You're just booking food, and most offers tell you to turn up during the time period to claim it. What happens if the establishment is full when you do? Are refunds possible? When booking, you're told to read the terms and conditions, but these aren't linked from that page (they're in the Settings menu, which is only accessible at the time of ordering by backing out to return to the main screen). There's a note while ordering saying that the restaurant is also compelled to feed



▲ MSN Food & Drink is absolutely stuffed with recipes and advice from famous chefs



▲ Finding discounted dining in London or Bristol is made easier using Wriggle



Urbanspoon offers reviews and recommendations for eateries but barely makes the grade, and Yell is arguably better

you once you order, but if there are no seats, then how can that happen?

Wriggle is a neat app that's well designed and which has a terrific grassroots vibe about it. However, it's not for every situation in which you and your mates find yourself hungry and needs to be used with the issues above in mind. Personally I would use the app to look for an offer in my locality, then head over to take a look at the establishment and tap to order only if everything checked out.

Urbanspoon

Although there are many apps and services that aim to turn the public into a fleet of reviewers, Urbanspoon focuses on food outlets. This is a sound idea, because it seems everybody nowadays wants to comment on what goes into their mouth – photos litter Instagram, as well as Facebook.

On a phone, the app shows a vertical column of restaurant pictures, inset against which are price scale (indicated by up to four pound signs) and also the type of cuisine and the distance from your current location (if your device lacks GPS you can choose from a map). On a tablet the same is true except that two vertical columns of restaurant thumbnails are shown.

Setting a location of the heart of London revealed that, perhaps surprisingly, Urbanspoon's database of establishments is far from comprehensive. A placeholder image appears if an establishment is unknown, and we saw this appear even for Wagamama – one of the biggest chains operating in the UK. Surely the folks behind Urbanspoon could at least rustle up the Wagamama logo instead of a placeholder image? Meanwhile, despite its location in the heart of London, and no doubt its

intense popularity, this same establishment has no user reviews or photos.

Should you switch the list to showing places by popularity, however, rather than distance, and it's a different matter – suddenly our list was populated with pictures, as well as reviews (expressed as an average percentage inset against the image of the restaurant). Selecting any entry slides in a page where you can view photos, view the menu and opening hours, and possibly book via the Live Bookings system. Popular dishes are listed, and you can note your own.

We guess searching via popularity is probably the only sensible way of using the app, although people in a rural area should beware: the furthest from our hypothetical central London location was 0.65km, but switching to Buxton in Derbyshire reported establishments up to 30km away. This is kind of useless if you're

visiting for the day and perhaps useless in any circumstance unless you enjoy driving or trains.

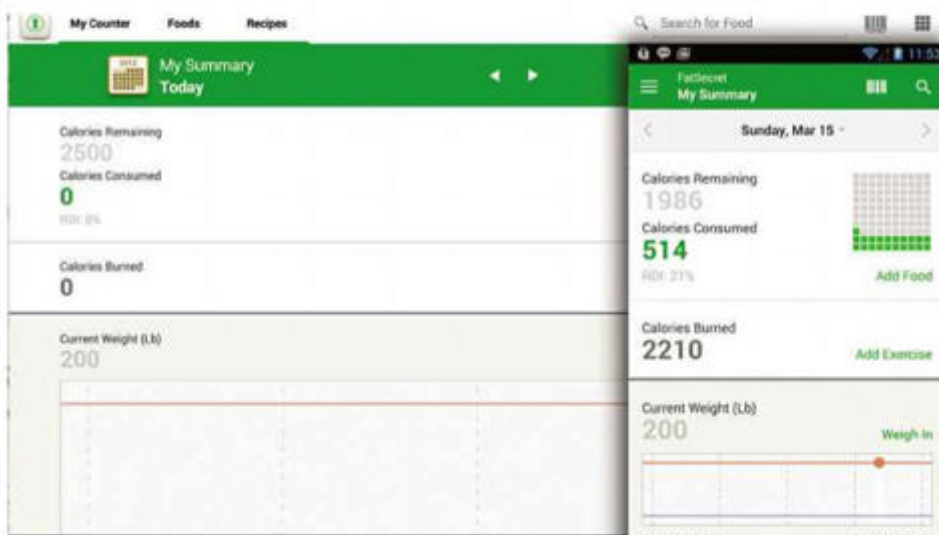
Several buttons running across the top of the screen let you filter by various criteria, including when the establishment is open (breakfast, lunch, dinner, late night) and cuisine, for which there is a very extensive list. Alas, this particular filter is arguably not as useful as it might be – filtering by vegetarian merely shows establishments that offer a vegetarian option, for example, which is pretty much all of them. It's impossible to filter by exclusively vegetarian kitchens. However, the Features filter offers some consolation – you can filter by vegan-friendly, for example, or by places that are coeliac-friendly. Other features you can choose from include just about everything an establishment might boast, including outdoor seating, sports, waterfront, live music and even free wi-fi.

Checking for a place you're about to visit can be done but is a little tricky, because you must locate it on a Google Map by tapping and dragging. This is okay for cities but harder for towns whose labels might not appear unless you're zoomed in.

There's a lot of potential in a food-only ratings and review app, but there's not a great deal in Urbanspoon that differentiates it from any other local search tools, such as Yell, which benefits from being much more popular with amateur reviewers and is therefore more useful.

Calorie Counter by FatSecret

Losing weight is theoretically easy – the total calories you swallow need to be limited to a certain amount, while physical activity means you expend calories.



Tracking what you eat and what you do is essential to losing weight, and Calorie Counter is the best we've seen

“ Losing weight is theoretically easy – the total calories you swallow need to be limited to a certain amount ”

Therefore the simplest weight loss plan is one of basic calorie counting – both in and out – and that’s what this app is all about.

Setup involves inputting your weight (in lb, so swot up on your 14x table), your height and also what you’re using the app for. Here you can set a goal of gaining weight – useful for those overcoming eating disorders or body builders – although most will set the app for either losing weight gently (recommnd by the app) or losing weight quickly. The result is that you’re given a calorie count for the day that you mustn’t exceed.

Every time you ingest something with calorific value or do any kind of exercise outside of your normal routine, you need to let the app know. There are entries for Breakfast, Lunch, Dinner and Snacks/Other.

Adding food you’ve eaten is about as easy as it’s possible to be. Pretty much every UK restaurant and chain is detailed within the Quick Picks section, so eating out isn’t the struggle it can be when you’re dieting. Generic foods are also listed, such as fruit, vegetables and raw ingredients like pasta. However, the cleverest part of the app is the barcode scanner, which uses your device’s camera to look at the barcode on a product to find its nutritional value. This proved a little temperamental in our testing, but this was very probably down the poor-quality cameras on our test equipment combined with less than ideal lighting. However, the app instantly recognised the two items we eventually managed to scan – an Uncle Ben’s instant meal and a tin of cheap spaghetti hoops from Aldi – which is pretty darned impressive. You can also search by simply typing the name of the product, with a special section detailing supermarket brands, and again this showed the app’s database is encyclopaedic. The app also lists things you’ve recently eaten and eat frequently, so you can quickly tap to add them.

Entering exercise is again simple, and you can search for what you’ve done and then input the time you spend doing it. Pretty much every activity we could think up was listed, with some entries splitting out into several categories – walking is split into brisk (6.5kmp/h), exercise (5.5kmp/h), moderate (5kmp/h) and slow

(3kmp/h), for example. Again recent and most popular exercises are listed for quick access, and you can also add a custom exercise if you can’t find what you’re looking for. You’ll need to input energy burned for a set duration, although Googling will probably supply the details you need.

You also need to enter the duration of your sleep/rest periods, because the app aims to track your calorie usage by simply being alive during the day and night. For a setting of sedentary, which befits the Micro Mart editorial team, a sleeping period of eight hours and resting period of 16 hours was assumed, giving a daily calorie burn sans exercise of 2,210. That sounds about right!

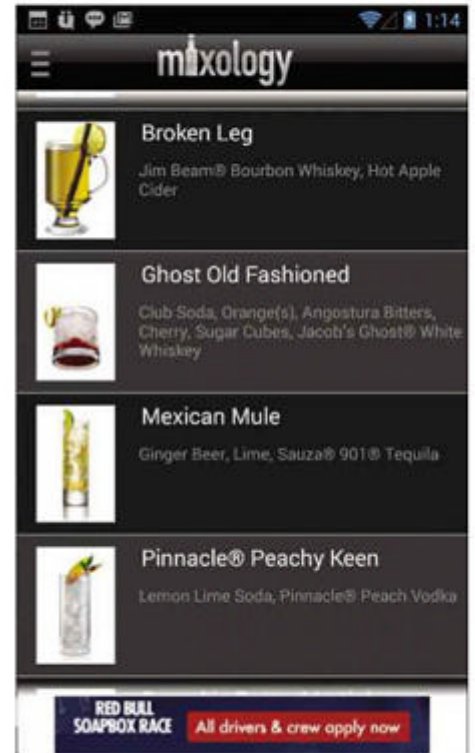
Google Fit integration is built in, so you can send data straight to that app, and cloud syncing is automatic, so signing in on your Android tablet as well as your phone means you can enter details into both.

All of what’s offered in the app is entirely free. There are no adverts, either. For such a well-designed, simple and useful app, such largesse really is to be applauded.

Mixology

It’s a well-known fact that the editorial office of Micro Mart is one where the clink of bottles provides background ambience, along with the shaking of cocktails. We were therefore delighted to come across this app that quite simply is a comprehensive guide to mixing fun liquids together in order to achieve a pleasant effect. Perhaps surprisingly, the many recipes aren’t restricted to booze, and you’ll find entries for mixing soft drinks too.

The app is designed for use on a mobile and treats a tablet as a larger version of a phone, thus making the interface look ugly and stretched (although still usable). Finding a new and exciting way to get sloshed can be done by viewing the New & Featured list, which appears when the app starts, although by opening the menu you can also view by Category (Cocktails, Hot Drinks, Jello Shots, Martinis, Punches, Shooters, etc.) and search all drinks by a keyword you type (Coke, Jack Daniels, etc.). The clever Liquor Cabinet component lets you tap entries in a list that



You can learn the most effective ways of mixing booze and soft drinks with the excellent and comprehensive Mixology

correspond to your own drinks cabinet’s contents, in order to find something you can make there and then, while a Random Drinks button will simply serve you a recipe – any recipe – in order to charm the pants off a paramour or to dull the general pain of existence.

The Bartending Tips & Tricks section is inaccurately described, because it’s mostly a dictionary of drinks and terms, with a handful of guides to some techniques added in (how to stir, shake or muddle, for example). However, such an encyclopaedia is still extremely useful if you’re new to the game (unlike the Micro Mart editorial team, of course).

Selecting a drink shows a list of ingredients, along with brief instructions on how to make it. Some drinks come with illustrations of what the finished product should look like, but this isn’t true of all recipes. If you find a drink you like or that’s particularly effective for achieving your goal, you can tap the star button to add it to a list of favourites.

There are two versions of Mixology – one that’s free and supported by always-visible banner ads as well as occasional full-screen ads and one that removes these for £1.49. That’s hardly a huge amount of money for such a useful app, but if you’re an occasional tippler the free version is likely to be all you need. [mm](#)

Remembering...

Kempston Interface And Joysticks

David Hayward get to grips with his Spectrum gaming this week

Gaming on the old rubber keyboard, 'dead flesh', 48K Spectrum was a part of our childhood and adolescence that we won't forget in a hurry. But often, the keyboard just wasn't up to the task of controlling the game the way we wanted it to.

Take Taito's *Flying Shark*, *Operation Wolf* and the hardware-destroying *Daley Thompson's Decathlon*, for example; these were games where the keyboard needed to take a back seat while the gamer got to grips with the latest joystick.

Most of us owned one of Spectravideo's Quickshot Joysticks, and the QuickShot II Turbo – the one that was red and black – was a firm favourite. However, the one true Spectrum joystick that formed the backbone of gaming peripherals was the Kempston range, with the Kempston Interface.

The Kempston Interface protocol was the hardware that saved the Speccy gamer from using the rather terrible Interface I, with Microdrive and networking support. The restrictive 16K programs that would only work with the Sinclair Interface 1 were ushered in at a time when the 48K was beginning to reign supreme, and they were exceptionally unreliable devices to attach to the rear end of the Spectrum.

The Kempston Interface, though, which came out at more or less the same time, worked exceedingly well and offered the gamer an Atari interface to plug their joysticks into. Remarkably, despite the fondly recalled screen distortion when you knocked the Kempston Interface plugged into the rear of the Spectrum's expansion port, the Kempston was a very stable peripheral and easy to program and implement into a game.

Its History

Kempston Micro Electronics was formed in the early 80s in Bedfordshire, in Kempston funnily enough.

It started off in 1982 with the Kempston PPI Port, a programmable interface IO for the MOS 8255 chip and various stackable connectors and expansion boards for kit electronics and very early kit form computers.

By 1983, Sir Clive had the country in the palm of his hand thanks to the Spectrum, and the company launched, for around £15, the Kempston Joystick Interface. The nine-pin Atari and Commodore standard proved exceedingly popular, so Kempston started that same

Did You Know...

- Kempston produced a serial, RS232 interface to connect to serial printers.
- The Kempston Mouse for the Spectrum came with a free copy of Art Studio and cost £50.
- The Competition Pro 5000 based Kempston joystick is available as a USB stick these days.
- There's even a homebrew kit that allows a Kempston Interface to plug into a PC via USB.

year to produce and sell the Competition Pro range of joysticks, usually as an accompaniment to the Kempston Interface.

According to those who programed the Spectrum, the inputs from a Kempston Interface and Joystick were read through port 31, which in BASIC could be read with the command IN 31. There were only five states to read for the Kempston: up, down, left, right and fire, but clever programmers could also utilise diagonal states.

But as the new models of the Spectrum came out, the Kempston Interface began to develop problems, causing frequent crashes and so on. And with the likes of the more advanced QuickShot range of joysticks and others, the now aging Competition Pro, 5000 and Pro Xtra, didn't have what it took to keep up with the gamers of the time.

Eventually, though, as the 8-bit machines were shelved and despite Kempston producing a mouse in 1986, the hardware started to fade away. Sadly, Kempston Micro Electronics closed the doors of Unit 30, Singer Way, Woburn Road Industrial Estate, Kempston early in 1987.

The Good

The Kempston Competition Pro was a mighty fine joystick. The pommel topped stick and a pair of large buttons made for a stick that could take some pretty heft abuse over the years.

The Bad

The slightest knock of the Kempston Interface and the game crashed which, after taking ten minutes to load, was a pain.

Conclusion

Thank you Kempston, you served us well. [mm](#)



▲ The Kempston Interface, my how we miss you



▲ The slightest job of the desk and you've lost the game



▲ The mightily impressive Kempston Competition Pro

The Things That Frustrate Us About... Excel

Excel is just another one of those programs that we all use, and all slightly resent

Like Microsoft Word, Excel is one of those programs that you end up using even if you don't really like it. There are alternatives out there, but for the sake of being able to send files to other people you work with, you generally end up using Excel, just because it's so common.

It's also one of those programs that you think everyone ought to be able to use, but often they can't. Badly formatted spreadsheets with boded together formulae that just about return the right data, sometimes (if you open them on a full moon after spinning in your chair three times), are all too common. If you're an Excel expert, it's frustrating to sort through other people's messes.

If you're not, it can be a nightmare trying to figure out how to make your spreadsheets do what you want them to, and watching more seasoned colleagues use shortcuts can seem like you're watching someone doing magic. You know there's no magic there really, and you ought to be able to replicate what they're doing, but somehow it's never that simple.

Whatever your level of expertise, chances are Excel sometimes drives you up the wall. Here's why.

Argh! Broken Formulae

Generally speaking, if you're using Excel, you're doing it because you want to store and manipulate data. You can enter all kinds of clever formulae into your cells to get Excel to spit out the information you want...

Unless, that is, you mistype something in one place, at which point the whole thing falls apart. Or you want to copy and paste something in, and it mangles your macros. Oh, and don't even think about trying to sort your data if you've got cell-referencing formulae in there. That's like opening a portal to another dimension, or something (or, you know... it'll create a load of annoying errors you'll have to work through).

Fix it: Nothing's going to stop you making the occasional typo, but there is a solution to the sorting problem – you can assign names to cells that means even when they've moved

location, the formula will still pull through the same data. Click on the Formulas tab then Name Manager to set up names for your cells.

Oops! Hidden Rows

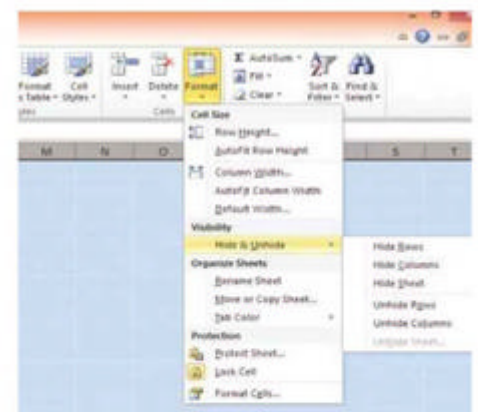
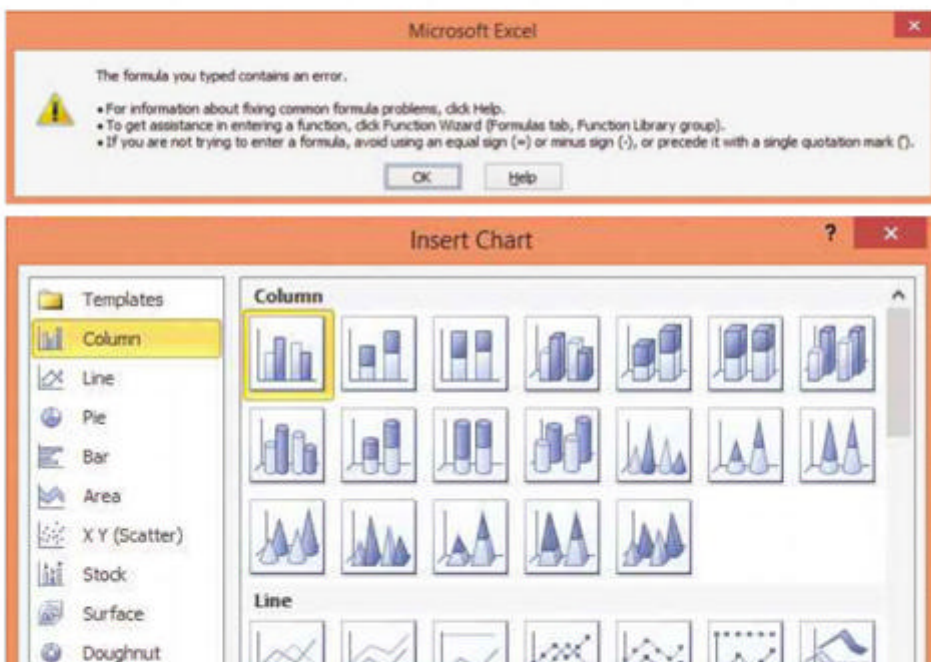
When you're working with a lot of data in one spreadsheet, you might want to hide some of it to make things more manageable; the data's still there, and can still be accessed, but it's just not on display. Super useful... until you're working on a spreadsheet with someone else and either they don't realise you've hidden some data, or you don't realise they have, and it all goes horribly wrong. Sounds unlikely? Scarily, it really isn't, and it's one of the most annoying things ever when you realise where the problem was.

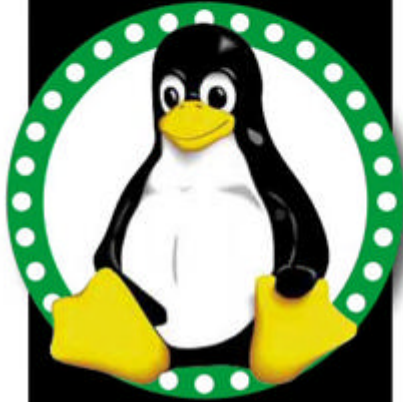
Fix it: You can unhide all hidden data in a spreadsheet by hitting the Select All button, then going to Format, then Hide and Unhide, and clicking to unhide all columns and rows. Might be worth trying if something bizarre seems to be going on with your work!

Ugh! It Makes Really Ugly Graphs

Excel makes it really easy to turn your data into graphs and charts. Unfortunately, it turns your data into *really* ugly graphs and charts.

Fix it: There are plenty of options available, so you can usually make your graphs slightly less hideous, but it's still a bit rubbish. Sorry. **mm**





David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Linux

Lollipop-Powered PCs

Android 5.0.2 live image for your PC?

I was reading the other day about a project that's currently receiving a fair amount of press on Sourceforge.

The AndEX Android x86 Lollipop live CD image is an .iso that enables the user to experience the newer Android OS on their PC as either a fully installed operating system or as a live system that's booted from a CD or a USB device.

There are already a few projects that allow Android to run on a PC, but most of them fall rather short of the mark when it comes to performance, practicality or anything even remotely resembling usability. This new project, from developer Arne Exton, promises to be the most stable and usable Android on a PC yet.

Apparently, it uses Arne's own custom Linux Kernel 3.10.58-exton-android-x86+, which has, according to the bump I was reading, support for NTFS read and write and some standard PC driver support. The Android image comes complete with Google Maps, Aptoide apps store and all the usual things, such as the

Android browser, music, gallery and so on.

However, Arne does mention that you'll need a fairly recent PC in order to get the best from the image, and you unfortunately won't be able to run it in VirtualBox – you can run one of his earlier Android versions in VirtualBox, though, should you wish.

Is It Any Good?

That's a good question. I did try to install it on the usual test laptop I have lying around for distro hopping and such, but it failed spectacularly when I tried to run the image.

After spending nearly an hour on getting it working, I decided that the best thing to do was to give it up and see if any of you lot would have better luck. If you do, then please let me know what you think of it.

It does make you wonder why, though. Arne states that, "If you like your Android phone and all the apps you have installed on it, I'm sure you will also like to run apps from your laptop. Bigger screen and better sound etc." That's a good enough reason

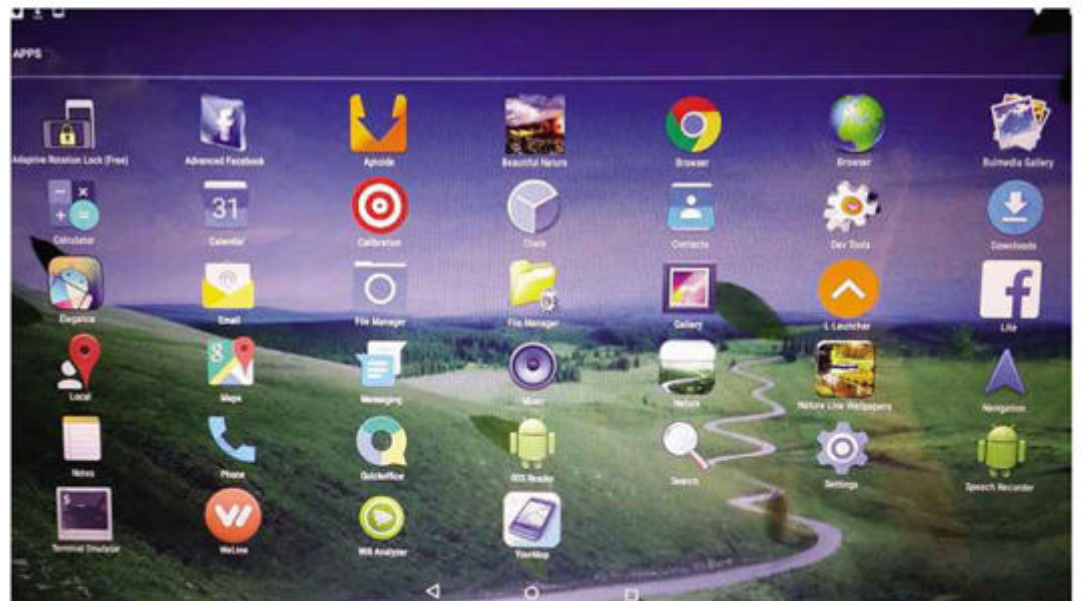
as any, I suppose. And you could argue that it's projects like this that keep the community alive and well.

But this does put me in mind of the project to get Android on a Raspberry Pi. It sounds like a novel endeavour, but since Android runs perfectly well, more or less, on a £30 tablet these days, in an environment and on hardware it was designed for, it does seem like something of a waste of time trying to get it to run on another system.

Emulation of other systems is great, don't get me wrong. And to successfully develop across different platforms, you'll need some way to talk between them. Perhaps, then, I've spent too much time trying to get something to work on a system it wasn't designed for and have become too cynical in my approach?

Either way, do let me know how you get on with this x86 Android spin. You can find the .iso at goo.gl/atp8mb.

▼ *Running Android on your PC? Let's hope it works for you*



World Wide Amiga

Sven Harvey has a surf

Though the Amiga platform predates the world wide web, the format is surprisingly proliferate on the internet. However, if you go and Google 'Amiga', trying to find what you're looking for is like trying to find a small metal tool in a huge pile of plant matter.

Main OS

If you're starting off and want to get an overview of the current version of the official AmigaOS from Hyperion Entertainment (currently AmigaOS 4.1 Final Edition), then your first port of call should be www.amigaos.net.

The site was put together primarily as an end-user centric portal for the resurrected platform, with the fully PowerPC Amiga operating system as its centre.

The alternative 'Amiga-like' PowerPC OS is MorphOS, which can be run on various PowerPC hardware including certain PPC Macs. The main site to start with is www.morphos.net.

Possibly of more interest to the PC user is AROS, and the best place to start I would suggest is with the Icaros Desktop distribution of the 'Amiga-like' OS. Popping to www.icarosdesktop.org will give you the option to download a DVD-ROM image of Icaros Desktop Live or a 'light' version for CD-ROM or USB drives, from which you can boot directly.

Of course, if you want the retro vibe, your best port of call if you're a PC owner is www.amigaforever.com, where you can grab the full classic Amiga emulation experience, complete with licensed Kickstart and Workbench OS components and Personal Paint for Classic AmigaOS. You might find a quick follow-up trip to www.dream17.info

Amiga News Sites

There are still several Amiga news sites and forums running around the net.

There are three main sites to pop to, and Amigans.net is the site primarily aimed at AmigaOS 4.x and Classic Amiga users and enthusiasts, and is still independant.

Meanwhile a broader cross section of the Amiga and Amigalike OS sectors is found at Amigaworld.net or the site that you could argue is where the others "budded" from, Amiga.org. It is worth bearing in mind that both Amigaworld.net and Amiga.org are financed by A-EON Technology.



dream17.info useful for some legally downloadable versions of Team 17's games to run on the emulator.

Hardware

Of course, if you want to use Amiga OS 4.x, seeing as it's PowerPC, you'll need something to run it on. There are currently two producers of hardware for the OS.

A-Eon Technology brought the AmigaOne X-1000 to market and is working not only on new hardware with its partners but also a whole array of native software for AmigaOS 4.1. Check them out at www.a-eon.com.

Alternatively, there's the not-quite-so-high-end AmigaOne 500 from Acube Systems, which also has Sam motherboards, so you can put your own system together (the Sam 460ex is the board in the AmigaOne 500, but other variations have been produced over the years). Check them out at www.acube-systems.biz.

Of course, the best way of getting hold of either is to go through Amiga Kit at

www.amigakit.co.uk, where you can also find a huge amount of software, hardware and accessories and peripherals

Software

The main repository of software on the internet for Amiga computing is Aminet. It offers filters so you can easily find, among other things, classic Amiga, PPC AmigaOS 4.x, MorphOS and AROS software, and the packages go all the way back to 1992. Aminet can primarily be found at aminet.net but is mirrored profusely.

AmigaOS 4.x has its own specific software site in the form of os4depot.net, which is eight years old. OS4depot is where you would go to get Timberwolf; the Mozilla port to AmigaOS 4.x, though AmiStore (see www.amistore.net) will be the main place for commercial software downloads once it's out of beta.

These are all just starting points really, and there's a lot of user generated content out there (there's an awful lot of Amiga content on YouTube, for instance).



Sven Harvey has been our Amiga specialist for over 15 years drawing on his 24 years retailing computer and video games (25 Christmases, no less) and even longer writing about them.

Amiga



Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

Cutting The Cord

Ian McGurran looks at the wealth of TV and film content on your mobile device

Like cinema stopped needing a cinema with the invention of the television, television is finding that it no longer requires the actual television itself to reach its audience. Such is the uptake of large screen mobile devices, like tablets, especially with younger age groups, there are ever more ways of watching TV and films on your mobile device that's beyond the terrestrial five channels. Those who partake of online-only content are known as 'cord cutters', not paying TV licences or subscriptions as they get their content through the web. But what are the cord cutters watching?

Now TV

Love them or hate them, but you have to hand it to Sky – Now TV is an excellent service for a great price. Essentially Sky-by-web, you can subscribe to the Movies, Entertainment or Sport packages, getting you Sky Movies, Sky's myriad entertainment channels or Sky Sports. While the day-pass sport package is okay for occasional use, the real gold is the Entertainment package. It offers the usual channels – Sky, Sky Atlantic, FX, Comedy Central, etc. – but, alongside the live channels is a huge on-demand 'box set' library. *Game of Thrones* series 1-4, *Fortitude*, a ton of ITV shows on ITV Encore, all for just under £7. Plus grabbing a Now TV streaming box with a three-month pass is often even cheaper.

MUBI

Netflix

It's not new or even a surprise to many, but the fact is Netflix is becoming an ever increasingly prominent player in the new media landscape. Not content with becoming arguably one of the driving forces behind the growth of streaming media (sometimes controversially), the ever growing collection of Netflix Originals TV series and films are giving the service a trump card. With shows such as *House of Cards* and *Orange is the New Black*, it's a trump card that's getting ever more effective. Liked *Breaking Bad*? Well, if you want to watch the prequel, *Better Call Saul*, over here in the UK it's Netflix or nothing. At £5.99 (for now), Netflix may well be worth it for these shows alone, especially as the actual film content is not quite up with Now TV.

Mubi

There are a lot of streaming services, so it takes something different to stand out from the pack. Mubi won't appeal to the masses, but that's what separates it. Filled with all those films raved over by film critics past and present, Mubi's roster of cult, independent and world cinema releases are manna from heaven for lovers of the cinematic arts. You won't get

an eyeball-searing from Michael Bay, but you may well get some Godard or Pasolini, alongside more contemporary independent film makers. Working on a rotating system of a new film per day, 30 films may not sound much, but sometimes too much choice is just as bad. Plus, £2.99 per month is less than a pint of beer.

HBO Now

If you're happy with a VPN tunnel and paying with a US account, many streaming possibilities open up to you, such as live US sports and premium US cable channels. Of all, the most premium may well be HBO Now. Even though it isn't broadcast in the UK, the HBO name should be very familiar to most as the company behind *The Sopranos*, *Band of Brothers*, *Boardwalk Empire*, *Game of Thrones*, *The Wire* and many more. So while you can't watch them here live, on HBO Now you will be able to, and on-demand afterwards too. HBO may well bring the service to the UK in the future too.

TV and film consumption is changing beyond recognition, and there are ever more ways of watching what you want, when you want. Whether it's on your tablet or if you push it to your Apple TV or Chromecast, you're watching TV in a whole new way, and there's soon going to be even more to choose from, with the likes of Apple rumoured to be launching a streaming service. No more guides, no more waiting – now, you're in charge of what you watch.

NETFLIX

Watching Temptation

Does Andrew Unsworth want an Apple Watch? Of course, he does, but he doesn't like the cost to his pocket or the environment

Being a fairly typical man, I've never been one for jewellery. Whether it's the craze for earrings and sovereign rings at school or society's boundless enthusiasm for massive gold chains that would look better on a bike than a neck, all these fashion crazes have passed me by. There is, however, one exception to this rule, and that is the wristwatch.

Like many people, I've worn a watch for years. After working my way up from the Transformers watch, I've had an ornate £115 Accurist on my wrist since 1996. It's served me well, with just the odd battery every year or two needed to keep it working, and that's how I like it.

That's why I feel like a Luddite in the face of the Apple Watch,

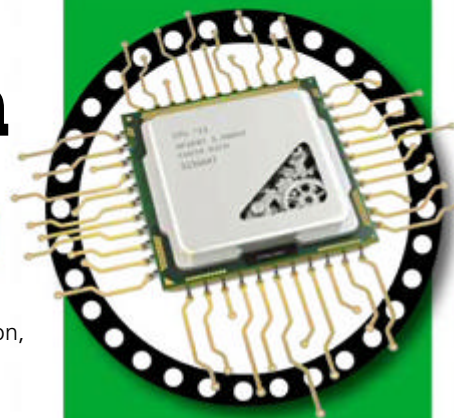
which will require frequent charging and will no doubt be superseded in a year or two, which will in turn trigger the obligatory urge to upgrade. I find the idea of abandoning the Apple Watch to landfill a few years after buying it appalling, along with the environmental and financial cost of charging it every other day.

Even so, I can't help looking at the Apple Watch and thinking 'nice' in a jazz club stylee, and I'm happy that Apple has seen sense to call it the Apple Watch rather than the iWatch. Sticking an 'i' in front of Apple's products seemed like a fun idea between 1998 and 2005, but the tidal wave of cheap, third-party accessories prefaced with an 'i' over the last decade and a half has made anything thus titled extremely uncool.

When the iPhone was released it fired my imagination, and I could see a point in it, but I don't feel the same sense of excitement with the Apple Watch. I have a working timepiece, and I have no problem pulling my phone out of my pocket if I want to use an app. I need to see the killer application that'll make me drop a small fortune on a smart watch, and that hasn't happened yet.

Most of all, I don't like the inherently disposable nature of the Apple Watch or any other smart watch. My watch has lasted almost 20 years, and I have one of my grandad's clockwork stopwatches, which is way older than me. If you can give me an Apple Watch that makes my life easier, more efficient and more fun without the need for frequent charging or an upgrade every one or two years, then I'll happily part with my money. Until then, I'll wait until I can get one second-hand to see what all the fuss is about. Possibly. Maybe. Oh, damn it, I want one.

“ I don't like the inherently disposable nature of the Apple Watch ”



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Hardware



Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

From Pillar To Post

Obsidian was left hovering on the brink of closure following the cancellation of a next-gen game for Microsoft. Fortunately, its Kickstarter campaign for Pillars Of Eternity saved the studio

This week, Ryan looks at how Obsidian Entertainment was saved by Kickstarter and takes an early look at Cliff Bleszinski's post-Epic shooter, BlueStreak...

Plug & Play

If you want an illustration of how harsh and unforgiving the world of game development can be, look no further than the recent history of Obsidian Entertainment. Formed by several members of Black Isle studios – including industry veteran Chris Avellone – in 2003, Obsidian has been responsible for such games as *Never Winter Nights 2* and its expansions, *Fallout: New Vegas* and *Dungeon Siege III*.

Sometime around 2011, Obsidian was working on something called Project North Carolina, which was set to become an exclusive next-gen title for Microsoft's then-forthcoming Xbox One. But by March the following year, that project was cancelled by Microsoft, forcing Obsidian to lay off around 20 or 30 members of staff and leaving the company on the brink of collapse.

The turmoil of that period was brought home in a documentary about the making of its latest game, *Pillars Of Eternity*. As a seven-minute excerpt published online reveals, the company was far nearer to folding than was previously understood.

"Unfortunately, when you crash, you crash hard, and for a company the size of Obsidian to have a project cancelled like that, it had a big impact on us financially," said the studio's project director Josh Sawyer.

Project North Carolina's cancellation wasn't the only blow for the company either. Middling Metacritic reviews for *Fallout: New Vegas* left the studio without a bonus from its publisher and, worse, Sega decided to cancel Obsidian's proposed RPG based on the Aliens universe – and just to rub salt in the wound, Sega had opted to publish the woeful *Aliens: Colonial Marines* instead.

The private crisis at Obsidian was such that, without a project to pursue and finances running out, it was mere weeks from closure. A turning point came when Double Fine had done out of a project it had launched on Kickstarter; what later became *Broken Age* was funded in March 2012 to the tune of \$3.3m.

Inspired by this, Obsidian pitched *Project Eternity*, a fantasy RPG that drew on the developer's roots in such Infinity Engine-based classics as *Baldur's Gate*, *Icwind Dale* and *Planescape*:

Torment. As executive producer and lead programmer Adam Brennecke notes, "Nostalgia's a big thing on Kickstarter", and so it proved: the project garnered a total of just over \$3.9m, which was then a record on the crowdfunding website.

That campaign not only got what's now called *Pillars Of Eternity* off the ground (which should have just launched as you read these words) but also got Obsidian back on track after a near-fatal creative and financial funk. Without crowdfunding, one of gaming's most respected developers may have closed for good.

Online

For most of us, the name Cliff 'Don't call me CliffyB' Bleszinski will be most closely associated with *Unreal Tournament* or certainly his genre-redefining third-person shooter series *Gears Of War*. But in 2012, Bleszinski left Epic Games, the studio he'd called home since the early 90s, and has since set up a new team with the name Boss Key Productions.

With Boss Key, Bleszinski is creating a new arena shooter under the working title of



Designer Cliff Bleszinski is back with a new studio and a new IP. Free-to-play arena shooter BlueStreak is his current work-in-progress



BlueStreak, which will be published by free-to-play specialist Nexon. "It's a wink after an old Transformer, not the beloved Martin Lawrence flick," Bleszinski said of the title, which immediately shattered our dreams into a million pieces. But while BlueStreak won't be based on a late-90s action comedy flick, we do know that it'll take place in a futuristic oriental setting.

To coincide with the Game Developers Conference, Boss Key launched a pre-alpha teaser trailer for the game (youtu.be/AzyiBgLxHfU), which provides an early glimpse of what its environments will look like; expect lots of cherry blossom, jade sculptures, samurai outfits and plenty of heavy artillery. These handsome environments, Bleszinski's revealed, will be powered by Epic's now free-to-use Unreal Engine 4.

"Ultimately, we found ourselves coming full circle to my friends at Epic Games," said Bleszinski, no doubt realising the irony of leaving Epic and then using its tech to build his studio's big debut. At another expo, PAX East, Bleszinski also defended his company choice of making BlueStreak free-to-play.

"Free-to-play doesn't have to be Game Of War, it doesn't need to be Candy Crush," he said, before adding, "I don't want it to be play-to-win."

During an Ask Me Anything session on Reddit, Bleszinski briefly

talked about the way BlueStreak would be funded.

"Free-to-play is one of those genres that means something entirely different depending on the game. For every model that feels like Las Vegas methods (Zynga, Candy Crush) there's folks who do it right, like League Of Legends or Warframe."

If you've been assuming that, based on Bleszinski's previous form, BlueStreak will take after the super-competitive Unreal Tournament series, you'd be right. "I want to make a skill-based game where someone who is really, really good is seen

as a player with nearly godlike abilities," Bleszinski said. "Sure, once in a while the person who sucks might get lucky with a stray shot [...] but I want to craft a game that has weapons and moves that are easy to learn, but to really make them sing takes thousands of hours of play just like a professional athlete would."

The natural question is how BlueStreak will fare against Epic's own free-to-play Unreal Tournament, which is making a community-based return after several years away from our screens. We'll just have to

wait and see how Bleszinski's design experience can measure up against Unreal's pre-installed following.

Incoming

We've noticed in the past that Grand Theft Auto 5 is one of those games that seems doomed never to appear on PC, but finally – barring any truly last-minute delays – it's almost here. Vaunted by Rockstar as the ultimate GTA experience, the PC edition promises to render Los Santos with the kind of visual fidelity and scale that even current-gen consoles can only dream of. A couple of comparison videos recently showed up on YouTube (youtu.be/5A6EBL2t6Lo), which

show off not only the expected texture improvements, but greater draw-depth, realistic hazy atmospheric effects and, most excitingly, flocks of birds fluttering through the sky.

Rockstar may have taken its sweet time over Grand Theft Auto 5 – just as it had with its much-anticipated Heists DLC, which was delayed for more than a year – but it does, at least, look as though the wait will have been worthwhile.

Grand Theft Auto 5 is out on 14th April.



▲ With improved atmospheric effects, hi-res textures and more animals than ever, Grand Theft Auto V finally hits the PC in April. We hope

AD INDEX

2/3 CCL	19 Gigarefurb
6/7 Morgan	23 Tier10Online
11 Refurb That	25 AOC
12/13 PC Specialist	99 Sapphire
15 Funstock	100 Microdream
17 Iiyama	

To advertise contact Karl Taylor
 t: +44 (0)20 7907 6706
 e: Karl_Taylor@dennis.co.uk

NOTE TO ADVERTISERS

Micro Mart © Dennis Publishing, 30 Cleveland Street, London W1T 4JD. Company registered in England No 1138891. This publication may not be reproduced or transmitted in any form in whole or in part without the written consent of the publisher. Quotations for re-prints or other use of material are available on application.

THE BUSINESS ADVERTISEMENT DISCLOSURE ORDER 1977 (effective from 1st January 1978) requires all advertisements by people who seek to sell goods in the course of a business to make that fact clear. It is the responsibility of the advertiser to comply with the order. Lineage trade ads in Micro Mart carry this *T symbol. It is an offence for which you may be prosecuted not to advertise the fact that you are a trader.

MICRO MART is published weekly by Dennis Publishing. Subscriptions rates available on request. Micro Mart welcomes the submission of articles and reviews for publication. Please enclose a stamped self addressed envelope; otherwise the return of material cannot be guaranteed. Contributions accepted for publication by Dennis Publishing will be on an all-rights basis. Views or opinions expressed by freelance contributors are not necessarily those of Dennis Publishing. Advertisements and goods/services offered are the sole responsibility of the particular advertiser and Dennis Publishing cannot be held in any way responsible. Whilst every care is taken the publishers cannot be held legally responsible for any errors in articles or advertisements or any resulting unsatisfactory transactions. We will however investigate incidents on a written complaint. © Dennis Publishing 2006. This publication may not be reproduced in or transmitted in any form in whole or in part without the written consent of the publishers. ISSN 956-3881. Blimey.

'THE BEST BOOK EVER WRITTEN ON HOW TO GET RICH'

J. Disorobo, Amazon.com

This is a book about getting rich. It's different from any other book on the subject because Felix Dennis made himself rich.

Very rich indeed.

And now he's going to show you how to do it!



THE CRITICS

'If this book doesn't get you rich, nothing ever will'

Mail on Sunday

'Well-founded advice based on hard-won experience'

Financial Times

'Full of honest insights. I strongly recommend this book'

Sunday Telegraph

THE READERS

'An inspirational book'

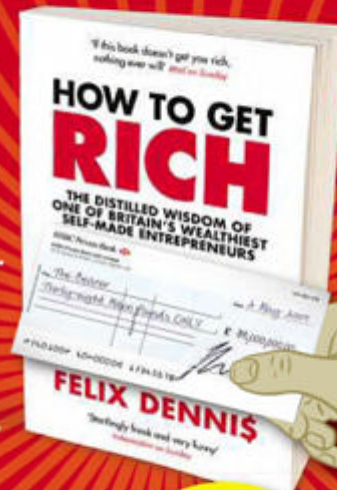
Alan Bates, Amazon.co.uk

'Essential reading. A great work'

Tom Rubython, Amazon.co.uk

'A true masterpiece'

'The Wanderer', Amazon.com



PAPERBACK EDITION OUT NOW £7.99

AVAILABLE NOW AT BORDERS AND ALL GOOD BOOKSTORES



www.randomhouse.co.uk/howtogetrich
www.felixdennis.com

'WISE, FEARLESSLY FRANK AND TRULY INSPIRATIONAL'

Mail on Sunday

FREE Private Classified Adverts



ONLINE

Visit our website, register and submit your classified advert at www.micromart.co.uk
Your advert will not only appear in our magazine, but be live on our website too!



POST

Simply fill in the form & post to:

Emma Corbett, Micro Mart, 30 Cleveland Street, W1T 4JD

◀ **NEW ADDRESS!**

Step 1

Write the wording for your advert in the numbered boxes below (one word each box). Maximum 30 words free.
Please complete in BLOCK CAPITAL LETTERS, then proceed to Step 2

1	2	3	4	5	30 Words FREE Private Ads Only <small>Trade ads MUST be boxed or reversed</small>	Boxed		Reversed		
6	7	8	9	10		£6.80	Private	Trade	Private	Trade
11	12	13	14	15			£13.60			
16	17	18	19	20		£8.00				£16.00
21	22	23	24	25			£17.00			
26	27	28	29	30		£1.70		£8.50	£17.00	£9.70
31	32	33	34	35		£3.40	£10.20	£20.40	£11.40	£22.80
36	37	38	39	40		£5.10	£11.90	£23.80	£13.10	£26.20
41	42	43	44	45		£6.80	£13.60	£27.20	£14.80	£29.60
46	47	48	49	50		£8.50	£15.30	£30.60	£16.50	£33.00
51	52	53	54	55		£10.20	£17.00	£34.00	£18.20	£36.40
56	57	58	59	60						

Step 2

Choose a category you would like your advert to appear in and tick the box.

- Hardware for sale
 Software for sale
 General for sale
 Accessories
 Hardware wanted
 Software wanted
 General wanted

Step 3

Complete all fields of your personal details and payment method.

Name

Address

Post Code

Landline Telephone No. Email

If I have more than 30 words, I have enclosed due payment. I am not advertising pirated, pornographic or any other kind of illegal software and my advert is both honest and legitimate. MM reserves the right to refuse or alter adverts at the discretion of the management. MM cannot be held responsible for the condition or quality of goods advertised. Your advert will be processed on receipt and will appear a.s.a.p. subject to space and availability.

Please tick appropriately Private Trade

I enclose payment by Cheque Postal order

or please Debit my Mastercard/Visa/Amex account No

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Expiry Date:



FAX this completed form to: 0207 907 6066

Authorise payment for £

Please Note: The standard Micro Mart conditions of advertising acceptance apply to all classified advertisements. Cancellations and amendments are not accepted to free ads. The publishers may refuse any advertisements and cannot guarantee insertion into any specific issue. Dennis Publishing will use your information for administration and analysis. We may share your information with carefully selected 3rd parties. We, or they, may send you details of other goods or services which may be of interest to you. The information may be provided by letter, telephone or other reasonable means of communication. If you do not want your details to be shared with carefully selected 3rd parties, please tick here.

IT

Essentials

TO ADVERTISE CALL
KARL TAYLOR

0207 907 6706

karl_taylor@dennis.co.uk

FILCO

The best keyboards in the world.

Available from

www.keyboardco.com

0845 205 5555

Today's news
today, not a
week later

- Breaking IT news
- News that matters to UK IT decision makers
- Updated throughout the day



IT news as it happens, online now at
www.itpro.co.uk

www.bit-tech.net

THE LEADING DESTINATION FOR PC ENTHUSIASTS & Hardcore GAMERS


bit-tech.net

Everything you'll ever need to know about **Windows 8**

MAGBOOK

MAGBOOK

THE ULTIMATE GUIDE TO **Windows**

8

For
laptops,
tablets
and PCs



Step-by-step guides

Over 150 pages of expert advice

Easy upgrades
How to transfer files
from Windows 7

Secret extras
Hints, shortcuts
and hidden tools

Stay secure
Block viruses and
protect your data

From the
experts at
PC
PRO

ON SALE NOW

Order your print or digital copy direct
from magbooks.com or call on **0844 844 0053**

Magbooks cover a range of topics from IT, Motoring to Fitness and Lifestyle

**ONLY
£7.99**

To place an ad in our classifieds, simply fill in the form at www.micromart.co.uk or send your ad by post to Maaya Mistry, Micro Mart, Dennis Publishing, 30 Cleveland Street, W1T 4JD

HARDWARE FOR SALE

Have you got any old kit lying around you'd like to get rid of? Fancy making a few pounds while you're at it? Why not advertise in the Micro Mart classifieds? It's easy and it's free, just email what you've got, how much you'd like for it, and your contact details to micromartclassifieds@gmail.com, and we'll do the rest. There are thousands of readers out there looking for components every week, and you may have something unwanted they've been searching for – so get in touch and save your kit from going to the tip!

ASUS P5QL-EPU Motherboard - 775 Socket - DDR2. Tested and removed from a working environment, comes with I/O Plate. £45 inc Free Courier. Payment via PayPal.
Email: info@jmcomputing.info

LAPTOP HARD DRIVE. 160GB SATA 2.5". WESTERN DIGITAL. Model: WD1600BEVT. Fully tested. Perfect working order. Partitioned and formatted NTFS. Free postage. Price £22. Paypal accepted.
Email: geofry@tiscali.co.uk

DESKTOP HARD DRIVE. 640GB Western Digital 3.5" SATA model WD6400AAKS. Perfect working order. Partitioned and formatted. Only used as back-up drive. Free delivery. Price: £33. PayPal accepted.
Email: geofry@tiscali.co.uk

Vintage Amstrad PC1512 HD20. Colour Monitor 20MB Hard Drive 5.25 Floppy Original Amstrad Disks Manuals spare Keyboard and Mouse. This is a rare fully functioning collectable. £60.
Tel: (01949) 876235
Email: hc4203@gmail.com

4x 1GB DDR2 Ram (OCZ Nvidia SLI PC2 6400 epp 4-4-4-15).

£40.00 for all 4 + Post/Packing. Perfect working order.
Email: ken.toole1@virginmedia.com

Seagate Barraucda 250GB SATA Hard Drive 3.5". Tested and removed from a working environment. £12 inc Free Courier. Payment via PayPal.
Email: info@jmcomputing.info

Corsair Vengeance 16GB (2x 8GB) DDR3 Memory CMSX16GX3M2A1600C10. Never used but box opened. Selling due to wrong voltage, these are 1.5V and I needed 1.35V. Asking £85.00 inc. postage to the UK.
Email: fabstock1@gmail.com

4x 1 GB DDR2 RAM (Ocz Nvidia SLI PC2 6400 epp 4-4-4-15) for Sale. £40.00 for all 4 + Post/Packing. In perfect working order.
Email: ken.toole1@virginmedia.com

HP Microserver n40l / windows 7 Pro / 4GB RAM / 400GB drive / MS Office 2003. This HP n40l Microserver is in excellent condition and comes with Windows 7 re-allocated, activated, & completely updated Feb 2015. Also installed is Minitools Partition Magic, MS Office 2003 HP basic, with codes/ coa's. Buyer may have Linux Mint, or a completely bare drive. 2 spare drive frames. I have the original packing as per HP original delivery. So far as I can see, this Microserver will take 16GB memory and up to five hard drives. See it working before buying, (by arrangement). No refund under any circumstances. Collect from Harrogate, North Yorkshire. £140. Cash on collection. Delivery might cost £8 via Hermes, maybe much more to Highlands/ Islands. Payment by Cheque O.K subject to clearing, Paypal at £25 additional. (to cover their fees).
Tel: (07794) 528857
Email it_central@ntlworld.com

Used Asus Wireless Router for sale. Dual-band 4 x GB Ethernet Wi-Fi RT-N66U N-900. £65.00 O.V.N.O. Selling cause I have no need for it since upgrade to BT Home Hub 5.
Email: beme12355@googlemail.com

SKY PLUS and SKY PLUS HD REMOTES. Original £7.50 + P&P please email or call me for more information.
Tel: David (01616) 888119 Email: pcmadnessltd@yahoo.co.uk

Intel Core 2 Duo E4600 3GHz 775 Socket Processor. Tested and removed from a working environment. £10 inc Free Courier. Payment via PayPal.
Email: info@jmcomputing.info

2 x 2GB DDR3 1600 MHz RAM. Recently taken from a 2012 mac mini. As new £25.
Email amstereofan@gmail.com
XFX GeForce Nvidia 8800Gts Graphics Card for Sale. £40.00 + Post/Packing. Perfect working order.
Email: ken.toole1@virginmedia.com

XFX GeForce Nvidia 8800Gts Graphics Card For Sale. £40.00 + Post. In perfect working order
Email: ken.toole1@virginmedia.com

Custom Built modified watercooled gaming desktop. i5 4670K, R9 280X, Silverstone RV-01 USB3, 1000W PSU: parachord sleeving, Z87M OC Formula, 8GB Kingston Fury 1866MHz, 180mm and 120mm Radiator. Numerous mods, Yellow and Black colour scheme! No Storage. Email for pics and info. Buyer collect: Gloucestershire. £800 ono.
Tel: Adam (07426) 874117 Email: flaming_monkey95@hotmail.co.uk

Asus A8V motherboard, socket 939. Clips holding CPU cooler broke, CPU overheated & shut down. M/B should be OK and there is 4GB of ram on board. Free, collect only. North Wales.
Tel: (01286) 678584
Email: gw7hav@googlemail.com

Kingston HyperX 2x2GB DDR2 1066MHz RAM. Tested and removed from a working environment. £45 inc Free

Courier. Payment via PayPal.
Email: info@jmcomputing.info

CPU sale. Intel Core 2 Duo E4400 2.0GHz £10, Intel Pentium 4 630 3.0GHz £7, Intel Celeron M 350 1.3GHz £5, Intel Celeron Mobile Dual core T1500 1.866Ghz £6, Intel Pentium 4 630 HT 3.0Ghz 2MB cache £8, AMD Athlon 64 3200 £5 Athlon 64 3500 £6 Athlon 64 3200 Dual core £10 postage £2.
Tel: Jeremy Gill (02089) 430683
Email: arthur.pewty1@virgin.net

2 x 512MB PC3200 DDR400. These two sticks were removed from my working system, now redundant. £5, plus £1 P&P.
Tel: Alan (02084) 202322
Email: alan@asandco.co.uk

DDR2 memory sale. 2 x Nanua PC2 3700 256MB £6 pair, 2 x HP PC2 4200 256MB £7 pair, 4 x HP PC2 4200 512MB £10 pair or £18 for four.
Tel: Jeremy Gill (02089) 430683
Email: arthur.pewty1@virgin.net

Asus M2N2-SLI Deluxe motherboard bundle. With AMD Athlon 64 4000 CPU, 4Gb Corsair ram, fan, backplate, manual, driver CD. £40
Email: david.white38@ntlworld.com

IBM/LENOVO SFF BASEUNIT. P4/ 2.8 H-T, 2GB RAM, 40GB Hard Drive, CD-Rom, 10/100 Network, sound, USB, Clean install XP-pro, fully updated, Office Suite, Anti-Virus, & all usual utilities, COA Licence Sticker & Install media, £25
Tel: Pat (07710) 348638
Email: pat4cars@aol.com

FUJITSU-SIEMENS MINITOWER. Pentium D 2.8 Dual-Core, 2GB RAM, 80GB Hard Drive, DVD-RW, Gigabit network, sound, Clean Install XP-pro, fully updated, Office suite, Anti-Virus & all usual Utilities, Legal COA sticker & System Image. £35
Tel: Pat (07710) 348638
Email: pat4cars@aol.com

DELL OPTIPLEX GX240 SFF. P4/1.6, 20GB hard Drive, 768MB

RAM, CD-Rom, 10/100 network, Sound, Front USB, Clean install XP-pro, fully updated, works OK but slow by modern standards, £15. Tel: Pat (07710) 348638 Email: pat4cars@aol.com

LG Flatron W2246S 22" monitor with power and VGA leads. No dead pixels in very good condition. £50 Buyer Collects (Verwood, Dorset) Tel: (01202) 826057 Email: geoffandcynth@themailspot.com

2x 1GB PC2100-648. These two matched sticks were removed from one of my redundant systems. Plus one PC2700 (DDR 333Mhz) and one 512Mb PC3200 DDR400 stick. All for £5 plus £2 P&P. Tel: Alan (02084) 202322 Email: alan@asandco.co.uk

Laptop DDR2 memory sale. 2 Corsair Value Select 533mhz 1GB £18 pair, 2 Hynix 800mhz 2GB £26 pair, 2 Generic 533mhz 1GB £15 pair, 1 Generic 800mhz 1GB £10, 1 Nanua 666mhz 1GB £, 1 Samsung 666mhz 1GB £8. Postage included Tel: Jeremy Gill (02089) 430683 Email: arthur.pewty1@virgin.net

Two 120GB Maxtor DiamondPlus 9 Drives plus one 80GB DiamondPlus 10. Can be supplied with two plug-in caddies. No reasonable offer refused. Tel: Alan (02084) 202322 Email: alan@asandco.co.uk

HP Elitebook 8760w i7 2820QM @ 2.2GHz 32GB RAM 750GB HDD Quadro 4000M GPU. Only 2 small marks on whole machine. Cost £3500 when new. £900 ONO Tel: (07772) 926632 Email: stedaley19@gmail.com

WD 2TB desktop hard disk. Formatted ready for an OS. Runs very nicely. New laptop means my desktop items must go! £40 includes free tracked postage. Tel: (01619) 501218 Email: jmbest2@sky.com

Toshiba C500D-B-11 laptop. Virtually new cost £279 will accept £150 O.N.O. Tel: (01217) 535324

Intel 3930K processor. Used, but not overclocked. No box or fan. £220 ono. Will ship to UK address. Tel: Tim (01623) 624509 Email: tim.stirland@btinternet.com.

Amstrad PcW 9256 in good working order with software. Offers. Tel: John Adams (02088) 641202 Email: meeching@uwclub.net

Asus P8Z68-v LX socket 1155 motherboard. Original box 1/0 cover user guide driver disk fitted core i3 2100 CPU 3-1GHz and 8GB PC1300 memory. No fan. Working fast and fine. £125 + free postage. Tel: (01619) 501218 Email: jmbest2@sky.com

ASUS P5B Motherboard - 775 Socket - DDR2. Tested and removed from a working environment, comes with I/O Plate. £35 inc Free Courier. Payment via PayPal. Email: info@jmcomputing.info

SAMSUNG GALAXY Tab 3 for sale. 2mths old, 8GB, wi-fi, £80 open to offers. Willing to post at a charge. Tel: Christine (01386) 831836

SoundBlaster Audigy SE 7.1 soundcard for sale. Perfect working order. Selling due to not being needed any more. Just £12 plus postage. Tel: Ian (01132) 629028 Email: ianmatthewuk@yahoo.co.uk

Asus p8h61-mle motherboard socket 1155. Original box 1/0 cover driver disk manual together with Celeron 91620 dual core CPU and 4 9195 pc1300 memory. Working fine. No fan. £70 + free postage. Tel: (01619) 501218 Email: jmbest2@sky.com

Toshiba Satellite SA60 laptop. Model PSA60E-092058EN. Windows XP Home Edition with Certificate of Authenticity. For spares or repair - broken power connector on mobo. No power cord. Otherwise in very good condition. £40.00 + p&p Tel: Peter Scarth (01452) 372350 Email: pscarth@blueyonder.co.uk

Apple Touch 32 GB iPod. Virtually new cost £199 will accept £100 O.N.O. Tel: (01217) 535324

400GB IDE drive 3.5 inch formatted ready for use. Only £20 plus £3 for p&p. I can load genuine XP Professional from Microsoft with genuine certificate of authenticity for an extra £10. Refurbished. Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

Amstrad PcW 9256 in good working condition with software. Offers. Tel: John Adams (02088) 641202 Email: meeching@uwclub.net

Panasonic KX-P7105 mono laser duplex printer. Some toner left. Up to XP only - hence £25. Buyer collects from N2, East Finchley Tel: (02083) 431527 Email: pnnikiel@gmail.com

Amstrad PcW 9256 in good working condition w/ software. Offers. Tel: John Adams (02088) 641202 Email: meeching@uwclub.net

GEFORCE 1GBYTE 24- PCI express PC card. HDMI DVI VGA PC video card. £10 plus p&p £4.50. 2 for sale. £10 each. Tel: (01707) 339063

Email: awhishaw@aol.com HP 4GB memory Microserver with two hard disc drives. £110. One with Linux MINT. Other with Linux FreeNAS. This will also run Windows 7 and Windows Server or Home Server. (Win 8 I've not tried it) Two spare HD slots with appropriate caddies. Slot for your SATA DVD drive also, (or use external usb or DVD drive if needed. four usb sockets on front, two on rear. VGA, network, power sockets on rear. Supplied in original HP box with CD and leaflets etc. Collect from Harrogate, North Yorks, or posted via Hermes for £12 (or less if I can do it cheaper). Cash on inspection and collection (Highlands and

Islands might obviously cost more to be delivered). Tel: (01423) 872045 Email: it_central@ntlworld.com

400GB IDE drive 3.5 inch formatted ready for use. Only £20 plus £3 for p&p. I can load genuine XP Professional from Microsoft with genuine certificate of authenticity for an extra £10. Refurbished. Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

EPSON PRINTERS T715 12 multipack F.O.C. to good home, just pay postage £2.50. (Tesco equivalent original cartridges £120 current special offer!) Perfect crisp printing etc. Tel: Pete Dew: (07526) 988594

EPSON PRINTERS T711 6 multipack F.O.C., just pay postage £2. Perfect crisp printing etc. May have others F.O.C. if model older than 12 months. Tel: Pete Dew (07526) 988594

Lexmark Printer Z601, still working and in good condition, £25. Tel: (01386) 832758

Intel 3930K processor. Used, but not overclocked. No box or fan. £220 ono. Will ship to UK address. Tel: Tim (01623) 624509 Email: tim.stirland@btinternet.com. Apple Mac G4 Tower. 400MHZ cpu, 640MB Ram, 2xHardDrive 40GB,20GB. DVD & ZIP Drive. OS X v10.3 Panther+OS9. NO KEYBOARD OR MOUSE. £25 ono Buyer collects Tel: (07941) 254296 Email: jasonnd@hotmail.com

Wireless Motorised IP Surveillance Camera. White In Colour - Control from your mobile phone/tablet/pc when out of the home - ideal for home security, baby monitoring, has sound and remote recording etc BNIB - £25 Price includes post and packing. Email:omendata@gmail.com

Dell Inspiron 660 Intel i5
QUAD CORE with ACER 23
Inch LED monitor. AS NEW.
Operating System: Windows
8.1. MPN:620MT. Memory
(RAM): 4 GB. Hard Drive: 1TB.
Processor Type: Intel Core i5.
Primary Drive: Optical DVD+/-
RW, Processor Speed: 3.0 GHz,
Features: Graphics Card GT620
1GB. Acer LED monitor 23"
HD. £520
Tel: Hitesh Rao (01163) 198895

PRINTER CARTRIDGES.
Suitable for Epson printer range
T711 - T714. Work perfectly. 50
pence each, plus postage (brand
new unused sealed). Over a
dozen available.
Tel: (07541) 222678
Email: petedew@gmx.co.uk
PRINTERS T481-T486 6 multipack
F.O.C. to good home, just pay
postage £2. Perfect crisp printing etc.
Tel: Pete Dew (07526) 988594

INKJET CARTRIDGES suitable for
Epson Printers T711 - T714 range,
and T481 - T486 range. 79 pence
each, plus postage. Work perfectly,
good crisp printing quality.
Tel: (07526) 988594
Email: petedew@gmx.co.uk

Powered PCI Express x1 To x16
Riser Card Extension via USB 3.0 +
Power Cable Adaptor. Allows you
to add an extra Pci-ExpressX16 slot
to your Pc converting an existing
x1 slot to x16. Useful for adding
an Extra graphics card to create a
Crossfire triple configuration or
for Bitcoin data mining up to 7
cards can be installed using these
adaptors. Quality model - Brand
new still boxed. £10. Price inc. P&P
Email: omendata@gmail.com

Laptop Removeable drive tray.
Allows you to add an extra hard
drive to your laptop by taking out
the CD/DVD drive. This device
inserts into the Cd/Dvd Empty
Slot and holds 1 Hard Drive.
Excellent Engineers Gadget -
Great for data recovery or just
beefing up your laptop. Two types
available - standard Sata To Sata or
Sata To Ide (Pata) Slot type. Brand
New Still In Box. £20.
Email: omendata@gmail.com

Amstrad PCW 9256. In perfect
working order including on-top
printer with a few 3" disks. Offers.
Tel: John Adams (02088) 641202
Email: meeching@uwclub.net
2 HP Laserjet 3100 printer-fax-
copier-scanners. In good working
order. £25 each.
Tel: John Adams (02088) 641202
Email: meeching@uwclub.net

Lian Li PC-X2000 Computer
Case. Supports mATX, ATX,
eATX; hot swap SATA drives,
six 3.5" & two 2.5" hot swap disc
holders. Three 140mm intake
plus two 80mm and one 140mm
exhaust fans. £140.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com
1.5TB SATA drive. Fully
refurbished by government
acknowledged company. All data
taken off (some drives are still
under Western Digital warranty)
ONLY £40 including P&P
Tel: Dave Thomas (01942) 706572
Email: davethomas96@aol.com

1TB SATA drive. Fully
refurbished by government
acknowledged company. All data
taken off (some drives are still
under Western Digital warranty)
ONLY £38 including P&P
Tel: Dave Thomas (01942) 706572
Email: davethomas96@aol.com

Blueberry I-MAC. Good condition,
all in working order, £55.
Tel: (01386) 832758
2TB Western Digital SATA
drive. Model WD2002FYPS
64mb cache, fully refurbished
by government acknowledged
company. All data taken off
(some drives are still
under WD warranty) ONLY £50
including P & P
Tel: Dave Thomas (01942) 706572
Email: davethomas96@aol.com

Motherboard Bundle. 2.4Ghz AMD
Athlon XP 32bit CPU 512MB Ram
5xpci 2IDE LAN sound good for
gaming, office work, surfing the net,
watching movies generally a good
all round system spec can slightly be
changed if required please email or
call me for a price.
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

750GB SATA drive. Perfect
working order. Formatted ready
to use. Only £25 plus £3 p&p.
Genuine Windows XP with COAY
can be pre installed for £10.
Tel: Dave Thomas (01942) 706572
Email: davethomas96@aol.com
4GB (2 x 2GB) of OCZ Reaper PC2
6400 ddr2 memory. Fast gaming
memory, used but in excellent
condition, £49.95 inc postage.
Email: baslake@blueyonder.co.uk

HP 5101 5102 5103 Netbooks and
Notebooks. Lots of parts available
down to the tiniest screw. Contact
with requirements.
Tel: (01892) 833413
Email: fwfj kent@gmail.com

Retro Commodore 64 with
1541 diskdrive tapedeck. All in
original boxes, mags. Pick up
from Somerset. £75 ono.
Tel: (01278) 691606

Brand new USB brackets. Add
2 extra USB2 ports to your
computer at little cost. Simple
to fit cable connects onto
the motherboard and uses a
spare slot on the back of your
computer. No drivers required.
Please email or call for a price.
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk
6 P3/4 PC bases for sale. £100 the
lot. All with XP. Must be collected.
Tel: (02387) 333212
Email: zen96403@zen.co.uk
MAC BOOK PRO A1151.
Spares and repairs 17" screen
2.16GHz Intel CPU looks in
good condition screen appears to
work. Please email or call me for
a price and more information.
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

Six p3/p4 PC with XP. £100 the
lot. Buyer collects. Get in touch
for more information.
Tel: (02380) 733312
Email: zen96403@zen.co.uk

Socket 775 System. Coolermaster
Case, audio + USB. Asus P5KPL-
AM EPU E6600 CPU. 250
GB Hdd. DVDRW, ATI 5450.
Boxes, drivers. Samsung 19"
Monitor HDMI USB. Keyboard

mouse. Windows 7 Professional
SP1. £100 collect from Louth,
Lincolnshire.
Tel: (01507) 602914
Email: flipinek@hotmail.co.uk

500GB SATA drive. 3.5" formatted
ready for use. Software can be
installed for an extra charge.
Windows 7 extra £35 includes
disk and certificate of authenticity.
Only £23 including P&P.
Tel: Dave Thomas (01942) 706572
Email: davethomas96@aol.com

Vintage Apple Macintosh
Classic II PC for sale. Complete
with keyboard, mouse and
microphone. Offers.
Tel: 07733 628986
Email 576924@tiscali.co.uk

AGP, PCI and PCI-e graphics cards.
Please email or call me for a price.
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

2 x 2GB Samsung DDR3 pc3-
8500 1066 SODIMM. 204 pin
as new laptop memory. £15 inc
postage to inland UK.
Email: jvital@mail2web.com
Dell OptiPlex 755 (80 GB, Intel
Core 2 Duo, 2.33 GHz E6550,
1GB memory, DVD/CDRW)
Ultra small form factor. Fantastic
small and very fast computer.
You will need to load the drivers.
XP Pro or Vista Business can
be loaded for an extra £10. The
hard drive and memory can be
upgraded for an extra cost. £70
plus £10 for delivery.
Tel: Dave Thomas (01942) 706572
Email: davethomas96@aol.com

Motherboard Bundle. 3Ghz
AMD 64bit CPU 512MB Ram
5xpci 2xSATA 2IDE 1Gb LAN 6
channel sound firewire. Comes
with driver CD and manual.
Good for gaming, office work,
surfing the net, watching
movies, generally a good all
round system. Spec can slightly
be changed if required. Please
email or call me for a price.
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

Brand new Laptop bag. Still sealed in the plastic bag and never used (it came as part of a bundle). Please email or call me for a price.
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

Brand new flatbed scanner. Still boxed and never used (it came as part of a bundle) Please email or call for a price.
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

Internal Card Reader. Compatible with most memory cards. Also has a USB port. Colour: black or silver. Please email or call me for a price.
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

CISCO CONSOLE CABLES. I have a lot of Cisco console cables all new let me know how many you would like please email or call me for a price and more information.
Tel: David (01616) 888119
Email: pcmadnessltd@yahoo.co.uk

HARDWARE WANTED

Trying to breathe life back into an old machine? Why not submit a wanted ad and see if any of the thousands of computer enthusiasts who read the magazine each week have what you're looking for?

WANTED: Working Dot Matrix Printer in Good Condition. Thanks!
Email: printer.20.odayly@spamgourmet.com

WANTED: Acorn computer either an A5000 or A7000. Also book on teaching yourself binary.
Tel: (07817) 861011
Email: Johnhaviland73@gmail.com

WANTED: Corsair PSU cable bag. Please email me if you can.
Email: Paul@planetvoodoo.co.uk

Wanted: HD 3850 Graphics card, must be AGP. Tel: (07817) 861011
Wanted: Fully working mainboard for AMD socket AM2+/AM3, micro ATX size. Must use DDR2 RAM.
Tel: Brian Taylor (07570) 452557
Email: bmorgant@yahoo.co.uk

Wanted: Factory system restore disc for a Dell Inspiron 1750.
Tel: Darren Day (07707) 556193
Email: ddshaggy@btinternet.com

SOFTWARE FOR SALE

Do you have any old software that you simply don't use? Why not advertise is with us and see if anyone else can make use of it - you may well be surprised to find that someone is looking for exactly what you don't need!

Cyberlink PowerDVD 12 Standard. Runs under Windows 8, 7, Vista or XP. Original CD with unused product key £7.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Nuance Omnipage 18. OCR Runs under Windows 8, 7, Vista or XP, Original CD with unused product key £25.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Acronis True Image Home 2012. Bootable CD. Application runs under Windows 8, 7, Vista or XP. Original Acronis CD with unused product key £5.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Acronis True Image Home 2012. Bootable CD. Application runs under Windows 8, 7, Vista or XP. Original Acronis CD with unused product key £5.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Windows 7 ULTIMATE 32 Bit and 64Bit DVD disks incl. SP1 This is my "Get Genuine Kit" from Microsoft not OEM. New install or legalise your copy with full Product Key. only £50 incl. reg. post
Email: Dave ochdgh@aol.com

Norton Family Premier 2.0. Runs under Windows 8, 7, Vista or XP, Original Symantec unused product key £15.
Tel: Ian (01932) 856971 Email: a2345@btinternet.com

Microsoft Office 97 Professional. Original disc with

key £18 inc postage.
Tel: Andrew (01376) 512118

Windows XP Professional. New and sealed. Book, software and license (certificate of authenticity) 100% genuine and unopened. (Dell branded but will install on any machine) ONLY £15 including P&P.
Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com

Cyberlink PowerDVD 12 Standard. Runs under Windows 8, 7, Vista or XP. Original CD with unused product key £7.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Nuance Omnipage 18. OCR for Windows 8, 7, Vista or XP, Original CD with unused product key £25.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

HP Windows XP Pro SP2 Re-Install Cd. Allows You To Restore Your HP PC / Laptop Without A Licence Key. Brand New, Packed. £10. Price includes p&p.
Email: omendata@gmail.com

Windows Vista 32bit for sale. Genuine item with genuine product key. £35 including P&P.
Tel: Ian (01132) 629028 Email: ianmatthewuk@yahoo.co.uk

SOFTWARE WANTED

Wanted: Windows 98 CD ROM operating system with boot disk, instruction manual and serial number. Tel: Craig (07867) 930265 or 01912093677
Email: craigtin44@hotmail.com

Wanted: LG GSA 2164 D software disc to replace broken original.
Tel: Glen Fremantle (01387)248976
Email: bldamsys@yahoo.co.uk

IMPORTANT BUYING ADVICE

We work very hard to police our classified ads, and make them as secure as possible. However, please do your bit too and use the following guidelines:

- **Never - NEVER** - pay by bank transfer or post out cash, unless you know the trader already, or are sure it is okay to do so. Pay by cheque, Paypal, Nochex etc wherever possible.
 - Be wary of anyone who insists on you paying by the above methods if in doubt, get us to check them out by mailing editorial@micromart.co.uk
 - Keep copies of all correspondence
 - When sending out goods, at the least obtain a certificate of posting from the Post Office
- If you are in any doubt, feel free to send us a mail via editorial@micromart.co.uk.**

Every year, thousands of successful transactions take place through our classifieds, and that's just how we like it.

Help us help you keep them one of the safest and most secure places to buy and sell computer kit.

ASK AARON



Meet Aaron Birch. He's here to help you with any general upgrading, software and system building issues. He's got advice aplenty, and you're very much welcome to it!

Send your questions to:
Aaron Birch
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Aaron by email at:
aaron@micromart.co.uk

Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

Banished Pop-ups

With reference to this week's *Micro Mart* (Issue 1351, page 90), and your advice regarding the Pop-up Provider problem. The help was very gratefully received. I followed your instructions and, although it didn't work exactly as you described, it did at least work. I am now pleased to report that I am rid of the pop-up. This a great relief – I wish I'd asked sooner!

Thanks, once again, for helping me overcome a problem I didn't understand; not only from my recent request, but also my previous requests and requests made by other readers. Where would we all be, without you?

I'm looking forward to getting my free copy of Windows 10, but first I have to upgrade my aged kit as it's only 32-bit and I understand that Windows 10 requires 64-bit architecture in order to work. Gives me the excuse I need, to build the pooter I want. Keep up the good work, we all appreciate it.

I'm happy to help, Russ, and I'm glad the solution worked for you, even if I didn't go exactly according to plan. Windows 10 will be a very interesting release from Microsoft, and when it comes to hardware specifications, it'll require the same basic set up as Windows 8. Microsoft has already confirmed this, so as long as your PC can run Windows 8 and 8.1, you should be okay. The specs for Windows 8.1 are as follows:

CPU: 1GHz or faster, support for PAE, NX and SSE2
RAM: 1GB (32-bit) or 2GB (64-bit)
Hard disk space: 16GB (32-bit) or 20GB (64-bit)
Graphics card: Microsoft DirectX 9 graphics device with WDDM driver

The lead of communications at Microsoft, Frank Shaw, previously confirmed these specs, also saying that PCs bought in the last five years – and maybe even older systems – will have no problems running Windows 10. So, you may not have to worry too much if your PC isn't too aged.

Russ



HDMI Loss

I am a regular reader of *Micro Mart* and read your column every week. My question involves HDMI and the different versions.

Specifically, I have an MSI B85 G43 motherboard, with HDMI 1.4 and a Realtek ALC892 sound chip. Will I be able to get lossless audio via HDMI 1.4, since they say only HDMI 1.3 supports lossless audio bit streaming, like DTS-HD and TrueHD?

been added, such as DVD audio for HDMI 1.1, higher speeds, deeper colour and lossless audio for HDMI 1.3 and support for 3D and 4K displays for HDMI 1.4. Each successive release has retained the previous advances, up to HDMI 2.0, which arrived back in 2013. If this wasn't the case, new devices would cause too many problems.

▼ **HDMI technology is backward compatible, so having a more recent version shouldn't cause problems**

Richard

The various different versions of HDMI are backwards compatible. This mean I'm pretty sure you won't have have any problems with lossless audio on a HDMI 1.4 board, as this should support everything from the previous generations. As the iterations have been released, new features have



Failure To Communicate

I've got a wired network at home with three Windows 7 PCs attached, but none of them can access each other, despite my ticking any and all boxes agreeing to share files in the disk property boxes.

When I try to access one system from Explorer on another PC, I'm asked for a password, which I don't have. I never put any passwords on any of my builds as they are all family computers, so what password does it want?

I would just say that they aren't on a Homegroup network, but one that existed when they were all XP machines. I've just replaced them all over time and now they are all Windows 7 PCs on the same network. Any help gratefully appreciated.

David

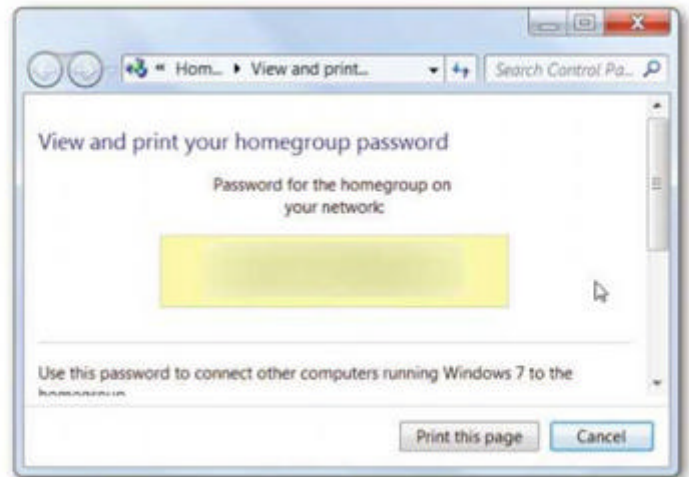
Using several PCs on a network in the home is a little different under Windows 7 than it was with XP, and the same method used for older OS won't really do the job. Instead, you have to use the Windows 7 version of HomeGroup (Windows 7 Home Premium and above). This set up will still allow files to be shared with older PCs too.

To begin, ensure your PCs aren't connected to a domain, which is unlikely, and then go to the 'Home network' section in the network location list. This should fire up the HomeGroup creation wizard, so follow the steps to create your new group, including the setup of a password. You or someone else may have done this previously, but forgotten.

Once the HomeGroup is created, you'll then be able to connect other PCs to it by following the same steps. Windows should detect the existing group and give you the option to connect to it by entering your specified password.

If you do have an existing HomeGroup, and you've forgotten the password, you can get help by clicking Start, typing 'homegroup' and then selecting the option to 'View or print homegroup password.'

▼ **Forgotten your HomeGroup password? It's easy enough to find**



Chipless Update?

Aaron, thank you very much for replying to my problem in your pages (Come again!, issue 1352). Your help and advice was spot-on, and I updated my BIOS within Windows 7 using my A10 APU. I am using my new A8 to write this email.

However, the question arises of how to update a BIOS with no functioning CPU installed. I don't need to, but others might.

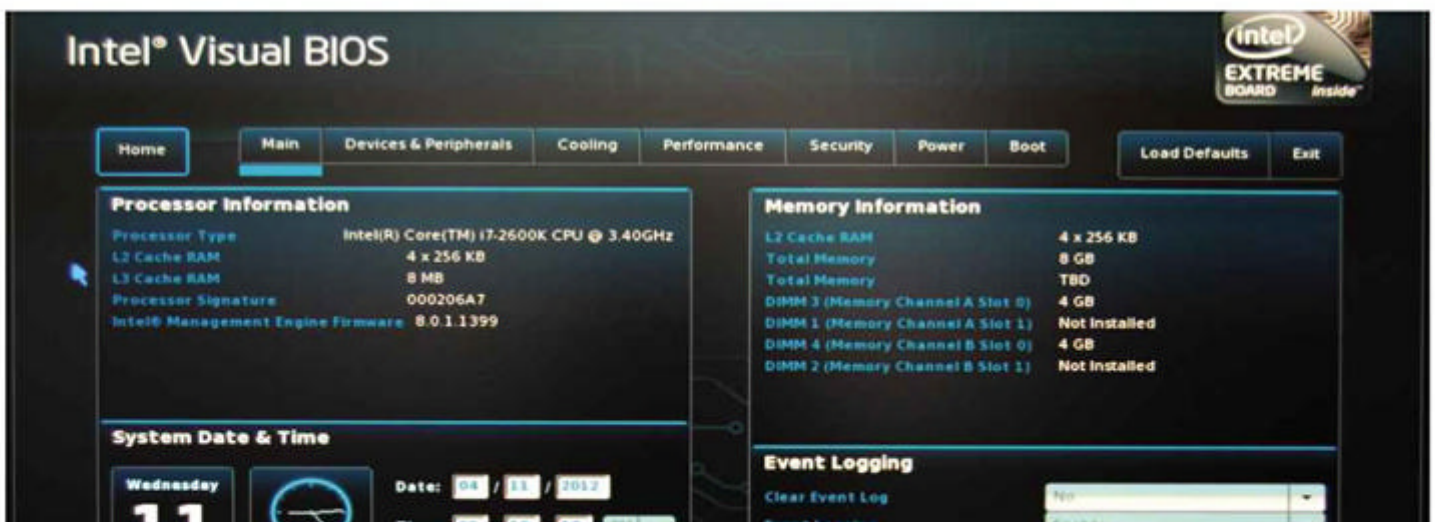
Brian

That's great news, Brian, thanks for letting me know what we suggested worked well. I'm happy the BIOS update sorted your issues. BIOS updates are often a great way to remedy compatibility problems, as well as a collection of other concerns, but I'm afraid you need a CPU to do so.

Without a working CPU of some sort installed, it's not possible to flash a motherboard BIOS or even boot the PC to the BIOS, so users finding themselves in such a predicament would be in trouble. The only way around it would be to buy a new CPU or at least buy the cheapest possible processor the board supports so it could be fitted and the board flashed.

Some PC repair shops may help with this and may be able to install one of their CPUs in order to flash the BIOS, but this would incur more cost, possibly more than the price of a cheap CPU. If other readers have problems of this type, I'd advise they check any warranty information first, as this could save on charges or the cost of a new CPU.

▼ **Without a CPU, you'll be unable to even load up the BIOS, let alone update it**



ASK JASON



Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

Send your questions to: Jason D'Allison
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Jason by email at: jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

All About The Image

My lad has asked for a gaming PC for his birthday. I'll be building it myself, and I've pretty much finalised the shopping list of parts. I'm in two minds about the graphics card, though. He'll need something that'll handle 1080p at good frame rates on games coming out over the next year or two, and with a budget of about £175, I'd settled on the GeForce GTX 760. I see that GTX 960 cards have started appearing, however, and some cost under £150. What's the catch? Should I stick with the GTX 760?

Andy Marks, Gmail

Well, as I often say, a rough-and-ready way to gauge a graphics card's performance is to compare its shader and GFLOPS numbers with those of the flagship single-GPU card in the same series. Just for you, Andy, I've put the vital statistics of the GTX 760 and GTX 960 and the relevant flagships into a little table.

COMPARISON OF MID-RANGE NVIDIA GPUS (WITH FLAGSHIP REFERENCES)				
Spec	GTX 960	GTX 760	GTX Titan X (9-Series)	GTX Titan Black (7-Series)
Core	GM206 (Maxwell)	GK104-225-A2 (Kepler)	GM200 (Maxwell)	GK110-430 (Kepler)
Shaders:TMUs:ROPs	1,024:64:32	1,152:96:32	3,072:192:96	2,880:240:48
Core Clock	1,127MHz	980MHz	1,000MHz	889MHz
GDDR5 Clock	7,010MT/s	6,008MT/s	7,010MT/s	7,000MT/s
GDDR5 Size	2GB or 4GB	2GB or 4GB	12GB	6GB
GDDR5 Bus	128-bit	256-bit	384-bit	384-bit
Pixel Fill Rate	36.1GP/s	31.4GP/s	106GP/s	42.7GP/s
Texture Fill Rate	72.1GT/s	94GT/s	176GT/s	213GT/s
GFLOPS (Single Precision)	2,308	2,257	6,144	5,121
DirectX	12.0	11.0	12.0	11.0
TDP	120W	170W	250W	250W

How Low Can You Go?

And here's another reader who's building a gaming system...

I'm a gamer on a very tight budget. Most of my cash will be going on the graphics card, and for the CPU I was going to use a Core i3 (a Haswell job, on Socket 1150). But could I get away with a Pentium? I'll upgrade later, probably to a Core i7, but for now, using a Pentium would save me the best part of £50.

Stefan, Bedfordshire

The GTX 760 has 1,152 shaders, which equates to 40% of the 2,880 shaders of the GTX Titan Black, the 7-series flagship. The GTX 960 has 1,024 shaders, which equates to 33% of the 3,072 shaders of the GTX Titan X, the 9-series flagship. While it's challenging to compare the specs of cards from different series, on paper the GTX 760 looks to be the winner here.

In terms of GFLOPS, the GTX 960 holds a negligible lead: 2,308 versus the GTX 760's 2,257. It holds more of a lead when it comes to core and memory clock speeds, but, my word, look at that 128-bit memory bus – half the width of the GTX 760's. The texture fill rate doesn't compare well either. Overall, the GTX 760 still looks the winner. As you've noted, this is reflected in its price.

Benchmarks tell another story, however. Cast your eyes over this extensive review at The Tech Report: bit.do/2A5p. In nearly every test, including in actual games, the GTX 960 leads the way, sometimes quite significantly. Like I say,

comparing specs of cards from different series is challenging, but it's clear the 9-series architecture offers noteworthy performance improvements. No doubt a result of Nvidia's new mobile-first strategy, it's also more efficient: with a TDP of 120W instead of 170W, the GTX 960 draws almost 30% less power than the GTX 760.

In short, Andy, drop your cash on the GTX 960. You'll also get full DirectX 12.0 support, not the partial support offered by DirectX 11.x cards, so you'll be sitting pretty when Windows 10 goes gold. Referring back to my earlier thoughts on shaders and GFLOPS, though, it's my view that a proper gaming card should have numbers at the very least a third the size of those delivered by the single-GPU series flagship (I also advise not going more than a generation or two back). The GTX 960 only just scrapes in. It'll do you proud, but don't settle for anything less.

▼ Is the new GeForce GTX 960 any good?

A Core i3 makes a stellar budget gaming CPU. But can gamers with empty pockets go even lower and get away with a mere Pentium? It's a very interesting question, Stefan. Really, a Pentium is a Core i3 with Hyper-Threading disabled and the HD Graphics cut in half (ten execution units instead of 20).

On a rig fitted with a dedicated card, the crippled integrated GPU is a non-issue, of course, but what's lost by not having Hyper-Threading? Well, get yourself over to The Tech Buyer's Guru: bit.do/2AVm. This super benchmarking article pits a Pentium against a Core i3, a Core i5, and a trio of

Core i7s. Most of the CPUs are clocked or overclocked to 3.7GHz, allowing for easy comparison.

The results are surprising. It's clear that certain game engines – the Crystal Engine variant in the Tomb Raider reboot, for example, and the Unreal Engine 3 variant in BioShock Infinite – don't utilise Hyper-Threading at all. In fact, more than two cores either real or virtual, are effectively ignored. A Pentium is as good as a Core i7.

However, with other engines – the CryEngine 3 variant in Crysis 3, for instance, and the Unreal Engine 3 variant in Batman:

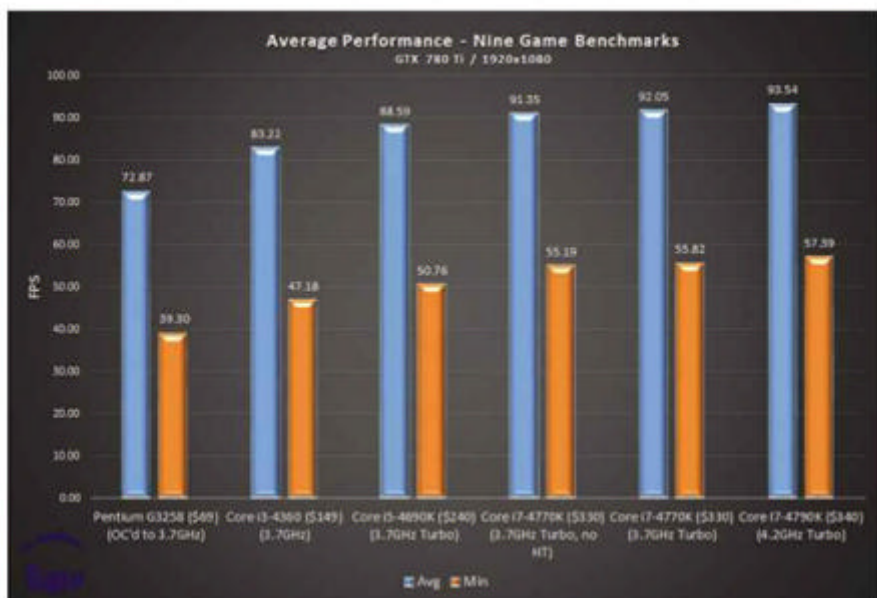
Arkham Origins (evidently wildly different to the one in BioShock Infinite) – it's obvious that cores are king, both real and virtual. Pentiums are destroyed.

Some games or engines benefit from extra cache or higher clocks too – and some don't. Possibly the most revealing graph in the Guru article is the one that plots each CPU's average frame rate, taken across all the tested games. It seems a Pentium is only about 14% slower than a Core i3 (given the same clock speed). Indeed, there's only a 26% drop-off compared to a Core i7 (again, given the same clock speed). Core i7s feature four real cores *plus* Hyper-Threading.

At a push, then, Stefan, a Pentium should suffice. Quite illuminating. Select games might be effectively unplayable, though, so if the piggy bank allows, a Core i3 is still the recommended entry point. Even so, there's no doubt a Pentium offers the best value (as illustrated in another Guru graph) – the G3250 (3.2GHz) costs about £45, while the i3-4160 (3.6GHz) costs very nearly double. What I'd love to see is a similar battery of tests that includes a Celeron...

Note – In the Guru tests, the Core i3 was a 43xx model, with 4MB of L3 cache. Most buyers go for the 41xx models, with 3MB of L3 cache – simply because they're typically £25 cheaper at any given clock rate. With one of these, the performance benefit over a Pentium would be even narrower (ever so slightly).

◀ Can the humble Pentium deliver enough poke for gaming?



Missing Link

I'm trying to repair a neighbour's poorly laptop. The HDD had failed, and I've now replaced it, so I need to reinstall Windows 7. Of course, there's no setup DVD or recovery media, so I want to download an ISO file I can burn to a DVD (I'm after 64-bit Home Premium). In the past I've used the official Digital River links listed at www.heidoc.net (bit.do/Vcgc), but those don't work any more. I've tried Microsoft's direct download, but my neighbour's product key isn't accepted.

J Barratt, TalkTalk

Unfortunately, Microsoft has now pulled the Digital River downloads of Windows 7. All the old links are dead. Instead, you're expected to head to Microsoft's own download portal: bit.do/2B5C. But as you've found, doing so is often a waste of time.

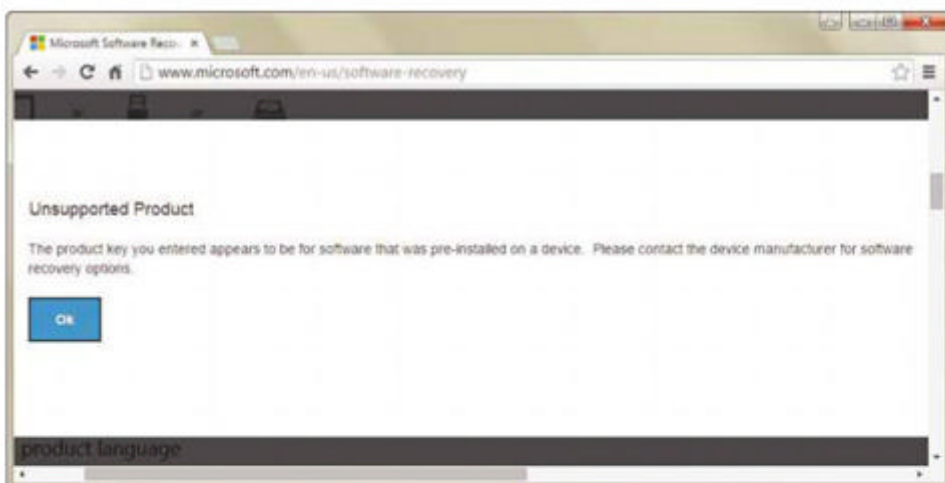
For starters, you need a valid product key, and the edition you're offered is the one related to that key. Now, some will argue that without such a key no-one has any business trying to download Windows 7 in the first place, but what about folks who regularly undertake system repairs? It's essential to hold discs of

every Windows 7 edition under the sun. What's worse, even if you do have a valid product key, unless it's a retail one and not one taken off the base of a laptop or pre-built tower, Microsoft will simply tell you to get lost.

So what's the answer? Well, one option is to 'acquire' the download you need via an 'alternative' source (say no more). Or you could borrow a setup DVD from a friend or foe or buy one off eBay. Windows 7 DVDs contain *all* editions

(though only 32-bit or 64-bit, not both), and by extracting the contents as an ISO file, deleting 'ei.cfg', and burning the modified ISO file to a new disc, the installation wizard will then always provide a menu from which you can select the edition to install. Please see bit.do/2Cb4 for more details.

▼ Why does Microsoft make users jump through hoops? Why?!



Crowdfunding Corner

Modularity is the word of the day today, with two Kickstarter projects that are built from smaller interchangeable pieces for maximum customisation.

Trickey – Any Key, Anywhere!

Keyboards never go out of fashion, but that doesn't mean there isn't room for new ideas. That's why the Trickey exists. It's a radically new type of keyboard based on modularity, so you can create fully customised, bespoke-layout keyboards for any purpose you imagine – though we expect them to be popular with gamers!

Connected in a 'building blocks' style, each Trickey base unit houses six keys in a 2x3 configuration. You can combine base units to make larger keyboards with keys arranged freely across them. When pressed, the key will produce its default character, but you can map these inputs to other letters, numbers or even multi-character inputs if you like (finally, you can create an 'undo' button!). A removable transparent keycap allows you to customise the label of the key with a number of downloadable templates, or you can create your own!

As well as gaming, it's useful for creating minimalist input devices for things like graphics editing suites and MIDI actuation, keeping your desk free for the things that matter to you. The commercial version of Trickey is ready to launch, and you can get a single base unit and six keys for \$139 (£95). It's well over halfway towards its target, with weeks still to go, so there's a good chance it'll get made, and it might exactly be the thing you're looking for!

URL: kck.st/1Ff2MX0

Funding Ends: Sunday, 10th May 2015



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

Premium One- The Docking Station For Apple Watch And iPhone

The launch of the new Apple Watch has undoubtedly got people excited, but what does the arrival of a smartwatch mean for people who have a charge dock for their iPhone? It means, not surprisingly, that it's time to get a new dock, and the Premium One is in there quick with exactly the thing you need: a combined iPhone/Apple Watch dock.

The Premium One is based on modular components so you can mount your Apple Watch, iPhone 6-series or 5-series and either an iPad Mini or an iPad Air. The stand is designed to fit components with and without cases and to minimise the difficulty of untangling chargers. Made from aircraft-grade aluminium, the solid unit is sturdy, heavy and mimics the high-quality appearance of Apple's devices themselves. Its modularity makes manufacturing and assembly super-quick, so if the project reaches its goals, you'll have the stand in your hands by June.

The cheapest units start at \$55 (£31), but if you want a dual-device unit, you'll have to pay \$95 (£65). The basic target is just \$35,000, and at time of writing they're \$18,000 into the project with weeks left on the clock. It's highly likely that these stands are going to get made, and if you back the project now, you could be among the first to get one!

URL: kck.st/1NV4XTM

Funding Ends: Saturday, 25th April 2015



App Of The Week

Sky Force 2014

David Hayward tests his metal against the constant onslaught of vertically scrolling enemies

What do *1942*, *Raiden* and *Flying Shark* all have in common? Well, aside from being vertical scrolling shooters, they were thoroughly awesome games that tested the calibre of the player.

You needed nerves of steel, reaction times bordering precognitive and the ability to memorise enemy attack patterns over hundreds of levels. Short of being one with the Force, getting very far on your first go on a vertical scrolling shooter wasn't happening. They were tough games, brutal often, but they were also immensely entertaining.

Back With A Vengeance

Sky Force, from developer Infinite Dreams, was one of the most impressive mobile games of the last decade. Those of you who fondly recall playing it on a Nokia 7610 way back when will remember the impressive graphics, intense gameplay and near ludicrous number of enemies your single fighter had to deal with over the course of a single level.

Now it's back and it's better than ever. *Sky Force 2014* is here to celebrate its tenth anniversary with even more enemies, even more impressive visuals and even more intense and quick thinking gameplay.

We're fairly sure there's some sort of story going on in the background, but to be honest like most of the vertical scrolling shooters from the past, we really couldn't care less. The point is all you need to know is that you're travelling from the bottom of the screen upwards, with enemies of different sorts – land based and air based – coming at you, and your job is to dispatch them to wherever it is those lads go once they've shuffled off this mortal coil.

Along the way you'll be able to pick up upgrades to improve your current weapon systems, and you'll collect stars which form the in-game currency. In between each level, or after you die, you'll be able to spend those stars on different weapon system, shields, a star magnet and other such enhancements to your ship; or you could opt to spend the points on increasing an already installed system.

Needless to say, you'll need those upgrades if you plan to survive beyond level one. Once you've maxed out your ship, you'll be able to take on almost anything the enemy can throw at you.

Also, at the end of each level you'll get a final score based on how well you cleared the level, how many of the potential maximum stars you collected and how many of the POWs you managed to rescue. If you succeed with 100% of everything, you'll be suitably rewarded.

Conclusion

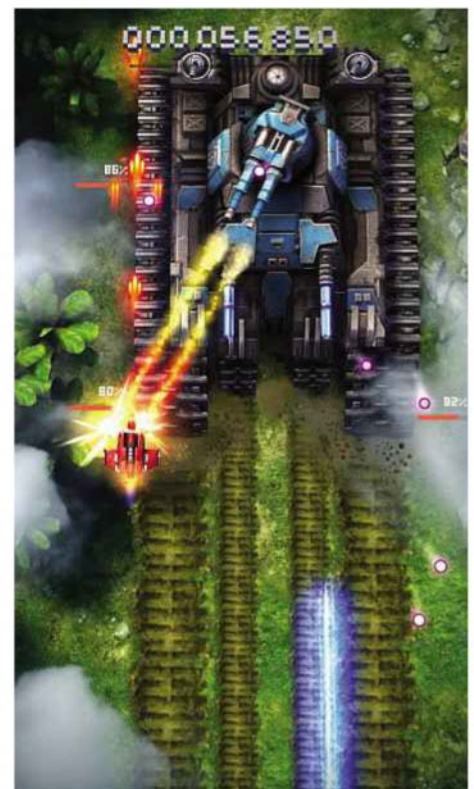
It's a simple genre, but one that works well, even on a phone or tablet. The ship you're piloting permanently fires, so all you need to do is move your finger around the screen to control its direction and try to survive. All in all, an enjoyable and splendid-looking Android game.

Features At A Glance

- Beautiful levels with immersive missions to complete.
- Multiple, extreme boss battles.
- Upgrade your shields, guns, missiles, lasers, mega-bombs and magnets.
- Risk everything to rescue civilians.
- Brand new weekly tournaments against other players.
- Boost your final score with a host of in-game achievements.
- Rescue fallen opponents to win extra lives and stars.
- Accessible to beginners, as well as hardcore shooter addicts.
- Full voiceover and incredible electronic soundtrack.



▲ Rage against increasingly tougher enemies and let's see how long you last



▲ Let's not forget the inevitable end of the level guardian to defeat

Logging Off

Normally, I'd have written this part of the magazine by this stage of the week, but it has taken me at least three days to stop laughing after the latest product launch by Apple. Perhaps it's the context of seeing it from this side of the pond, but I found large chunks of it unintentionally hilarious. From Tim Cook's QVC inspired promotional spiel – "most personal device we've ever created" – to the videos of smelting 'aluminum' (whatever metal that is), like comedy gold it kept on flowing.

Then, undoubtedly the *pièce de résistance*, came the watch with a top-priced model that Tim was forced to rush over (and which, unlike every other cost, the Apple PR team didn't see fit to display on the screen behind him). If you missed it, and it was easy, the Gold version of the Apple Watch could cost as much as \$17,000 depending what wristband you go with. While the price may vary, what is pretty certain is that it will be obsolete within a year of being available in 2016.

However, as utterly bonkers most of the Apple presentation and products were, I did pick up one interesting development that truly surprised me. The new MacBook – ridiculously thin, and now stupidly coloured too – has a feature the implications of which I'm still trying to come to terms with. I'm talking specifically about the USB-C connector, which Apple has decided you only need one of, even if the machine quite clearly has room to host many, many more.

Only having one seems exceptionally silly, considering that this one port is the only means to physically connect any peripheral and it is also used to charge the device. It also means that to have HDMI out and be powered simultaneously you'll need a \$79 adapter. Wow. That's hubris on a scale that even dwarfs the huge pile of cash that Apple has made from people crazy enough to buy the iPhone 6.

The more I thought about this, though, the stranger it struck me as being. For starters, USB Type-C isn't proprietary Apple tech, so it can't stop others making cables and affordable adapters. I'm sure it's PR department will run stories telling me to only buy Apple lest its very expensive computers develop a nasty rash from unbranded cables. Yet, that it didn't alter the standard to make it totally unlike the impending PC version is a somewhat shocking departure from the norm.

Possibly even more intriguing is the question of where this leaves Apple's 'port of the future': Thunderbolt? Having rammed this

EDITORIAL

Editor: Anthony Enticknap
theeditor@micromart.co.uk

Designer: Kevin Kamal
Bonus John: John Moore

Contributors: Mark Pickavance, Shaun Green, Jason D'Allison, Joe Lavery, Sven Harvey, Simon Brew, Shaun Bebbington, Ryan Lambie, James Hunt, Mark Oakley, Ian Jackson, Roland Waddilove, Pizza, Sarah Dobbs, David Hayward, Leo Waldock, Ian McGurren, Aaron Birch, David Briddock, Ian Marks, Craig Grannell, Kevin Pocock

Caricatures: Cheryl Lillie

ADVERTISING

Group Ad Manager:

Andrea Mason
Tel: 020 7907 6662
andrea_mason@dennis.co.uk

Sales Executive:

Finan Tesfay
Tel: 0207 907 6898
finan_tesfay@dennis.co.uk

Sales Executive:

Karl Taylor
Tel: 0207 907 6706
karl_taylor@dennis.co.uk
US Advertising Manager
Matthew Sullivan-Pond
matthew_sullivan@dennis.co.uk

MARKETING

Marketing Manager:

Paul Goodhead
Tel: 0207 907 6393

PRODUCTION

Production Coordinator:

John Moore
0207 438 2074
MicroMartAdCopy@gmail.com
Digital Production Manager:
Nicky Baker

SUBSCRIPTIONS

Save 24% on the cover price:
£77.50 for 51 issues by credit card.
Visit subscribe.micromart.co.uk
Tel: 0845 126 1014

ONLINE SUBSCRIBER SERVICE

www.subsinfo.co.uk
Change your address, renew
subscription or report problems.
UK Subscriptions: **0844 844 0082**
micromart@servicehelpline.co.uk

NEWSTRADE SALES

Newstrade Director:
David Barker

DENNIS PUBLISHING

Group Publisher:
Paul Rayner
paul_rayner@dennis.co.uk
Managing Director:
John Garewal
Group Managing Director:
Ian Westwood

COO: Brett Reynolds

CEO: James Tye

Company Founder: Felix Dennis

PUBLISHED BY Dennis Publishing

30 Cleveland Street
London
W1T 4JD
Tel: 020 7907 6000
www.dennis.co.uk

PRINTING

Printed By: BGP
Distributed By: Seymour

Certified Distribution:
13,712 average copies
Jan-Dec 2010



technology down everyone's throat for the past few years and convinced the Apple faithful that this was the definitive connection technology, it's now been banished in favour of what is essentially a repackaging of USB 3.0 (not even USB 3.1). Right now anyone who has invested heavily in Thunderbolt-connected storage will probably be wondering if they've been lead down the garden path, and probably quite rightly so. However, amongst the craziness that can deliver a gold coloured Netbook – with a single port for everything – at a mere \$1,299, a tactical move away from proprietary technology should really warrant some spontaneous applause.

I've seen plenty of coverage of this event where the words 'this would never have happened in Steve Jobs' day' were used. In respect of USB-C issue, that's 100% right. He'd hate Apple using something it doesn't exclusively control.

Mark Dickavance



THIS WEEK'S CROSSWORD

Across

- 7** A popular social news site that lets people discover and share content from anywhere on the Web. (4)
3 An arrangement whereby software or artistic work may be used, modified, and distributed freely on condition that anything derived from it is bound by the same conditions. (8)
9 A collection of characters, ISO-8859-1 or Unicode for example. (7)
10 Conspicuously and outrageously bad or reprehensible. (5)
11 An electrochemical method of chemical analysis. (12)
13 Discarded, surplus, obsolete, or broken electronic devices. (1-5)
15 Capital raised by corporations through the issue of shares entitling holders to an ownership interest. (6)
17 The process of making small loans to cash poor people to enable them to start a business, esp. to help people in developing countries escape poverty. (12)
20 Straight lines from the centre to the perimeter of a circle. (5)
21 A trainable module that parses text looking for structure. (7)
22 Raise to a higher energy level. (8)
23 + (4)

Down

- 1** Convert code into ordinary language. (8)
2 Something that is eagerly pursued or sought after. (5)
4 An unplanned temporary loss of network connectivity. (6)
5 Highly directional radio aerials made of several short rods mounted across an insulating support and transmitting or receiving a narrow band of frequencies. (4,8)
6 Concern with environmental issues, viewed as a fashion or fad. (3-4)
7 A unit of computation, analogous to a UNIX process. (4)
8 A fake grassroots social media campaign that seeks to create the impression of legitimate buzz or interest in a product, service or idea. (12)
12 A computer game included with Windows, based on a card game with the same name. (2,6)
14 The daughter of Minos and Pasiphae who fell in love with Theseus and gave him the thread with which he found his way out of the Minotaur's labyrinth. (7)
16 What you might grab after a hard days coding. (1,3,2)
18 .np TLD. (5)
19 Costing nothing. (4)

LAST WEEK'S CROSSWORD

- Across:** **7** GREP, **3** Mythical, **9** Outlook, **10** Ugric, **11** Sparkle Metal, **13** Entity, **15** IFrame, **17** Deregulation, **20** Laser, **21** Nadella, **22** Yosemite, **23** NTFS.
Down: **1** Glossies, **2** Extra, **4** Yakker, **5** House Of Cards, **6** Cortana, **7** Loci, **8** Cooks Theorem, **12** Beanbags, **14** Theists, **16** Subnet, **18** Inlet, **19** Play.

DISCLAIMER

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. We've just watched the solar eclipse as we write this; actually, to be more accurate, we've just watched Dara O'brain and Brian Cox watch the eclipse as – just as happened all the way back in 1999 – we weren't organised enough to sort out any of those silly 3D-type shades that you need to look at the sun safely in such situations. Nor, as we pledged we would be by this age, are we the

owner of a Bond-villainesque mountain top observatory hideaway. So, Coxy it was. While our disorganisation has not changed in the last 16 years, one thing that has is the phenomenon of recording such events in minute detail on social media for the pleasure of, well... ourselves, really. Thus, this time around we managed to coalesce with our own little corner of Twitter in order to record our disappointment at the cloud cover, and mock those who'd been much more prepared than us to get the best out of the event. This made it all that much more fun. I mean, seriously, the cosmic ballet of the spheres that occupy this part of our particular outer spiral arm are interesting enough, but there's nothing like coming up with the perfect hashtag or GIF to really make an event memorable.



In Next Week's Micro Mart*

- Computer spillages: what to do when disaster strikes
- Understanding and using Windows power profiles
- Get to grips with alternative printing systems
- How to fit watercooling – step-by-step guide
- Plus the usual mix of news, reviews and advice



* May be subject to change

We're Not Playing Around

Cool and Quiet. Made for Extreme Gamers. The Vapor-X series.



Vapor-X R9 280X OC

Gold Award Winner!
3GB GDDR5 Overclocked, Tri-X fans, Vapor-X technology, tons of features. Is there a better R9 280X out there?



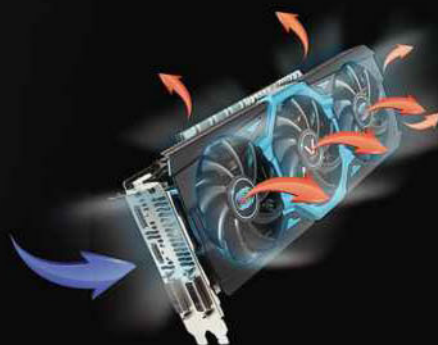
Vapor-X R9 290 OC

Gold Award Winner!
4GB of overclocked GDDR5, Tri-X™ fans, 6 phase power and Vapor-X technology.

Vapor-X R9 290X OC

The Editors Choice Gold Award
Faster, cooler, quieter Tons of features -
for the Extreme Gamer.

✱ Now with 8GB GDDR5!



Vapor-X™, hot graphics, kept cool.

High-end graphics cards use more power, which means they get hotter quicker. With the innovative Vapor-X, we were the very first to apply aerospace-industry vapor chamber technology to graphic cards. It's a pioneering way to accelerate heat away from the graphics chips into the rest of the cooling system. The result? More silent cooling for extreme performance.



AMD

RADEON
GRAPHICS

SAPPHIRE

www.sapphiretech.com

©2014 SAPPHIRE Technology LTD. All rights reserved. AMD, the AMD Arrow logo, Radeon and combinations thereof are trademarks of Advanced Micro Devices, Inc. ©2014 Advanced Micro Devices, Inc. All rights reserved. AMD, the AMD Arrow logo, AMD OverDrive, Radeon and combinations thereof are trademarks of Advanced Micro Devices, Inc. Microsoft and DirectX are registered trademarks of Microsoft Corporation in the United States and/or other jurisdictions. Other names are for informational purposes only and may be trademarks of their respective owners.



Gaming PCs ready



We offer the most affordable Gaming Desktop Computers

from **£ 139.90** inc VAT

Gaming PCs advanced



- Quad Core Processors
- Huge Memory RAM
- GTX 750Ti Graphics
- Genuine Windows 7

from **£ 219.90** inc VAT

Refurbished Windows 7 computers are helpful to families, students, businesses and good for the environment!

iPad

with Retina display
Just as stunning. Twice as fast.




- 4th Gen
- WiFi
- iOS 8.1



Scan me with your smart phone

£ 219.90 inc VAT





lenovo. FOR THOSE WHO DO.

£ 199.90 inc VAT

CORE I5 2.40GHZ

4GB DDR3

160-320GB

14.1" WIDESCREEN



Scan me with your smart phone



Scan me with your smart phone >>



- ✓ Professionally Refurbished Computers
- ✓ Properly Licensed PCs & Genuine Software
- ✓ Peace Of Mind with Great Quality & Value

Call 01803 269 861 or
Visit our store
MICRODREAM.CO.UK
Go Online for the latest offers!

